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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 11, NUMBER 23
DECEMBER 1, 1978

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 23
DECEMBER 1, 1978

W78-11301 -- W78-12100

The Secretary of the U.S. Department of the Interior has determined that the publication of the periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
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07 RESOURCES DATA
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08 ENGINEERING WORKS
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09 MANPOWER, GRANTS, AND FACILITIES
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

THEORETICAL MODELS OF HYDROLOGIC PARAMETERS USING DERIVED DISTRIBUTION TECHNIQUES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
R. L. Bras, and S-O. Chan.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 500-520, 1978. 11 fig, 16 ref.

Descriptors: *Parametric hydrology, *Stochastic processes, *Mathematical models, *Rainfall-runoff relationships, *Probability, Hydrologic data, Volume, Analytical techniques, Equations, Intensity, Duration, Kinematic wave theory, Systems analysis.

The frequency distribution of the volume of water above certain threshold discharge rates resulting from runoff is developed. This is accomplished using basic and accessible information: the joint probability density function of rainfall intensity and duration together with expressions, to be derived, relating the volume of interest to rainfall intensity and duration. The resulting closed form expression for the probability density function of the volume will be very useful in the design of flood control structures in urban areas. (See also W78-11386) (Bell-Cornell)
W78-11389

DESCRIPTIVE PROPERTIES OF HYDROLOGY MODELS FOR THE EXPLICIT STOCHASTIC OPTIMIZATION OF MULTI-RESERVOIR OPERATIONS,
Alcan Smelters and Chemical Ltd., Montreal (Quebec).
For primary bibliographic entry see Field 4A.
W78-11414

STREAMFLOW MODELING OF UPPER INDUS RIVER CATCHMENTS,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Resources Engineering.
S. Selvalingam, and A. Masood.
Water Resources Bulletin, Vol 14, No 4, p 827-841, August 1978. 11 fig, 6 ref.

Descriptors: *Streamflow, *Synthetic hydrology, *Model studies, Mathematical models, Watersheds(Basins), Runoff, Surface runoff, Rivers, River basins, Tributaries, Simulation analysis, Hydrographs, Rainfall, Rainfall-runoff relationships, Hydrology, *Indus River(Pakistan).

The streamflows of three tributaries, Siran, Haro, and Soan in the upper Indus River catchment in Pakistan, were simulated using SSARR and Tank Models. Channel characteristics of the main Indus River also were determined using the two models. The basin characteristics were derived by trial and error method and were verified using the data for the period 1964-1970. Comparison of the two model performances showed that low flows were better reproduced by SSARR, while the high flows were simulated with equal accuracy by both models. (Sims-ISWS)
W78-11881

A QUASI-LINEAR SPATIALLY DISTRIBUTED CELL MODEL FOR THE SURFACE RUNOFF SYSTEM,
Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Civil Engineering.
M. H. Diskin, and E. S. Simpson.
Water Resources Bulletin, Vol 14, No 4, p 903-918, August 1978. 7 fig, 3 tab, 10 ref.

Descriptors: *Surface runoff, *Watersheds(Basins), *Model studies, Mathematical models, Runoff, Rainfall, Precipitation(Atmospheric), Precipitation excess, Excessive precipitation, Hydrographs, Analytical techniques, Synthetic hydrology, Hydrology.

The paper presented a spatially distributed model consisting of cells that are interconnected in a pattern similar to the major drainage network of the watershed. Each cell receives as input the rainfall excess for the area represented by the cell as well as inflows from cells located upstream. Outflow from the cell is derived by routing the total input through the cell assuming it to be a linear reservoir during the storm. The time constant of the cell, however, was allowed to vary from storm so that the model may be described as a quasi-linear model. The model was tested with rainfall excess and direct surface runoff data available for a medium size watershed with satisfactory results. The time constant was found to be related to the rainfall excess of the storms studied, its value decreasing with the increase in the total rainfall excess. (Sims-ISWS)
W78-11882

AN APPLICATION OF THE RUTTER MODEL TO THE ESTIMATION OF THE INTERCEPTION LOSS FROM THETFORD FOREST,
Institute of Hydrology, Wallingford (England).
J. H. C. Gash, and A. J. Morton.
Journal of Hydrology, Vol 38, No 1/2, p 49-58, July 1978. 3 fig, 1 tab, 15 ref.

Descriptors: *Model studies, *INterception, *Forests, Hydrology, Rainfall-runoff relationship, Estimating, Rainfall, Evaporation, Stations, Weather, *Rutter model, Rainfall interception, Interception loss, Forest structures.

The Rutter model of rainfall interception in forests has been used with data from an automatic weather station, to estimate interception loss from Thetford Forest, for 21 four-week periods during 1975 and 1976. The estimates were compared with measurements of the interception loss, with good agreement between observed and predicted evaporation. The sensitivity of the model to the 2 major characteristics of the forest structure also was investigated. (Lee-ISWS)
W78-11887

FLOW GENERATION BY CATCHMENT MODELS OF DIFFERING COMPLEXITY - A COMPARISON OF PERFORMANCE,
University of the Witwatersrand, Johannesburg (South Africa). Hydrological Research Unit.
For primary bibliographic entry see Field 2E.
W78-11888

COMPARISON OF EAST FRACTIONAL GAUSSIAN NOISE AND BROKEN LINE MODELS FOR GENERATING ANNUAL FLOWS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
R. Srikanthan, and T. A. McMahon.
Journal of Hydrology, Vol 38, No 1/2, p 81-92, July 1978. 5 fig, 4 tab, 9 ref.

Descriptors: *Streamflow, *Streams, *Australia, *Model studies, Mathematical models, Synthetic hydrology, Rivers, Markov processes, Analytical techniques, Hydrology, Fast fractional Gaussian noise models, Broken line processes.

A comparison was made between the fast fractional Gaussian noise (ffGn) and broken line (BL) models using the data from 14 Australian streams. An alternative procedure (similar to that of ffGn) was suggested for the use of BL model and applied to actural data. From the results, it was found that BL model is computationally more efficient and preserves the long-term persistence effects as well as the ffGn model. (Sims-ISWS)
W78-11890

FIRM OUTFLOW FROM MULTIANNUAL RESERVOIRS WITH SKEW AND AUTOCORRELATED INFLOWS,
Technical Univ. of Lisbon (Portugal). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-11891

FLOW AGAINST DISPERSION IN ADSORBING POROUS MEDIA,
California Univ., Davis. Dept. of Land, Air and Water Resources; and California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-11894

MICRO-RELIEF SURFACE DEPRESSION STORAGE: CHANGES DURING RAINFALL EVENTS AND THEIR APPLICATION TO RAINFALL-RUNOFF MODELS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
J. K. Mitchell, and B. A. Jones, Jr.
Water Resources Bulletin, Vol. 14, No. 4, p 777-802, August 1978. 4 fig, 11 tab, 11 ref.

Descriptors: *Runoff, *Depression storage, *Soil surfaces, *Model studies, *Laboratory tests, Mathematical models, Surface runoff, Rainfall, Simulated rainfall, Rainfall simulators, Storage, Soils, Erosion, Infiltration, Watersheds(Basins), Hydrology, Micro-relief.

Micro-relief surface depression storage is one of the dynamic components of the rainfall-runoff process. The quantification of the effect of rainfall intensity and duration on the micro-relief was the subject of this study. Micro-relief measurements were made on 88 soil bin samples before and after the application of simulated rainfall events. The surface depression changes were described with empirical equations, using basic rainfall, surface hydrology, and soil parameters and their cross products as independent variables. A rainfall-runoff model demonstrated the values of a dynamic description of the surface depression storage function. (Sims-ISWS)
W78-11934

GROUND WATER-SURFACE WATER RELATIONS IN THE SILVER CREEK AREA, BLAINE COUNTY, IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-11978

PROGRESS REPORT ON HYDROLOGIC INVESTIGATIONS OF SMALL DRAINAGE AREAS IN NEW HAMPSHIRE--PRELIMINARY RELATIONS FOR ESTIMATING PEAK DISCHARGES ON RURAL, UNREGULATED STREAMS,
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-11988

AN ANALYSIS OF STREAM TEMPERATURES, GREEN RIVER BASIN, WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 2K.
W78-11989

DISTRIBUTION OF PHYTOPLANKTON IN MARYLAND LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.

For primary bibliographic entry see Field 5C.
W78-12100

2B. Precipitation

DEVICE FOR EXTRACTING ENERGY, FRESH WATER AND POLLUTION FROM MOIST AIR,
For primary bibliographic entry see Field 3B.
W78-11949

2C. Snow, Ice, and Frost

A LEGAL REGIME FOR THE ARCTIC,
For primary bibliographic entry see Field 6E.
W78-11331

PRELIMINARY RUNOFF AND STREAMFLOW PREDICTIONS IN THE HUMBOLDT RIVER BASIN BASED ON SNOW DISTRIBUTION MEASUREMENTS FROM SEQUENTIAL SATELLITE IMAGERY,
Nevada Univ. System, Reno. Renewable Natural Resources Div.
For primary bibliographic entry see Field 4A.
W78-11366

SNOWMELT-FROZEN SOIL CHARACTERISTICS FOR A SUBARCTIC SETTING,
Alaska Univ., College. Inst. of Water Resources.
D. L. Kane, R. D. Seifert, J. D. Fox, and G. S. Taylor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 093, Price codes: A04 in paper copy, A01 in microfiche. Report No. IWR-84, January 1978. 64 p, 19 fig, 2 tab, 27 ref, append. OWRT A-054-ALAS(1), 14-34-0001-7004.

Descriptors: *Snowmelt, *Frozen ground, *Cold regions, *Infiltration, *Soil moisture, *Soil temperature, Snow cover, Soil properties.

The pathways of soil water in cold climates are influenced, in addition to the normal forces, by the presence of permafrost and the temperature gradients in the soil system, whereas the infiltration of surface water into the soil system in a function of moisture levels, soil type and conition of the soil (whether it is frozen or not). Snowfall, with subsequent surface storage over a period of several months, typifies Alaskan winters. This snowfall often accounts for 50 per cent or more of the annual precipitation, with ablation occurring over a time span of 2 to 3 weeks in the spring. The melt period represents an event when large quantities of water may enter the soil system; the possibilities exist for recharging the groundwater system, or else generating surface runoff. The objective of this study was to determine the magnitude of potential groundwater recharge from snowmelt. Instrumentation was installed and monitored over two winter seasons to quantify the accumulation and ablation of the snowpack. Thermal and moisture data were collected to characterize the snowpack and soil conditions prior to, during, and following the ablation. Lysimeters were installed at various depths to intercept soil water. The volume of potential areal recharge for 1976 was 3.5 cm and for 1977 was 3.0 cm, which represented about 35 per cent of the maximum snowpack content. It is concluded that permafrost-free areas can contribute significantly to groundwater recharge during snowmelt ablation.
W78-11377

ICEBERG CALVING FROM FLOATING GLACIERS BY A VIBRATING MECHANISM,
Department of the Environment, Ottawa (Ontario). Glaciology Div.
G. Holdsworth, and J. Glynn.
Nature, Vol 274, No 5670, p 464-466, August 3, 1978. 2 fig, 18 ref.

Descriptors: *Icebergs, *Antarctic, *Vibrations, Model studies, Mathematical models, Mechanical properties, Ice, Waves(Water), Ocean waves, Glaciers, Oceans, Sea ice, Iceberg calving, Ice tongue, Super tabular icebergs.

Observations of Antarctic super tabular icebergs, which can exceed 100 km on a side, have shown that their origin frequently can be traced to previously existing super ice tongues, which are a class of massive seawars-extending ice shelves. Furthermore, a history of cyclic growth and calving can often be inferred or demonstrated. Because the calvings do not generally occur along a line coincident with the grounding line, where, under normal tidal flexure the stresses are greatest, and because multiple fracturing is observed, a nontidal theory for ice-tongue fracture was sought. A mechanism for generating significant bending stresses at locations along an ice tongue far from the grounding zone is by vibration of the glacier in a mode higher than the fundamental. In this report, an approximate analysis of the modes of free vibration of a buoyant, elastic, tapering ice tongue floating in shallow water of variable depth was outlined. (Sims-ISWS)
W78-11421

ICE SHEET TOPOGRAPHY BY SATELLITE ALTIMETRY,
EG and G Washington Analytical Services Center, Inc., Rockville, MD.
R. L. Brooks, W. J. Campbell, R. O. Ramseier, H. R. Stanley, and H. J. Zwally.
Nature, Vol 274, No 5671, p 539-543, August 10, 1978. 5 fig, 1 tab, 20 ref.

Descriptors: *Remote sensing, *Radar, *Ice cover, Topography, Topographic mapping, Radar, Satellites(Artificial), Mapping, Ice, Glaciology, *Greenland, Ice sheets, GEOS3, Radar altimeters, Satellite altimetry.

The surface elevation of the southern Greenland ice sheet and surface features of the ice flow were obtained from the radar altimeter on the GEOS 3 satellite. The achieved accuracy in surface elevation was approximately 2 m. As changes in surface elevation are indicative of changes in ice volume, the mass balance of the present ice sheets could be determined by repetitive mapping of the surface elevation, and the surface could be monitored to detect surging or significant changes in ice flow. (Sims-ISWS)
W78-11422

THE CAUSES OF GLACIATION,
Lethbridge Univ. (Alberta). Dept. of Geography.
C. B. Beaty.
American Scientist, Vol 66, No 4, p 452-459, July-August 1978. 3 fig, 60 ref.

Descriptors: *Glaciation, *Climatology, *Model studies, Mathematical models, Glaciers, Ice, Climates, Oceans, Solar radiation, Albedo, Volcanoes, Geology, Ice ages, Contributing factors, Continental drift.

Possible contributing factors that caused the major glaciations of the earth were studied using a mathematical model. Five of these factors were found to have a role in the glaciation. It was concluded that major glaciations have been caused not by dramatic changes in the earth's climate, but by the conjunction of several discrete factors at times when the continents were located at high latitudes. (Sims-ISWS)
W78-11434

DAMS ON PERMAFROST,
For primary bibliographic entry see Field 8D.
W78-11435

APPROXIMATE METHOD OF CALCULATING THE TEMPERATURE STEADY STATE OF WATER-PERMEABLE DAMS,
For primary bibliographic entry see Field 8D.
W78-11436

APPROXIMATE CALCULATION OF THE THERMAL REGIME OF RESERVOIRS FORMED BY A FROZEN DAM,
For primary bibliographic entry see Field 8D.
W78-11438

ALTERNATE METHODS OF AVALANCHE CONTROL (INTERIM) (1975-1976), PHASE II,
Washington Univ., Seattle. Dept. of Civil Engineering.
E. R. LaChapelle, J. B. Johnson, J. A. Langdon, C. R. Morig, and E. M. Sacket.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 364, Price codes: A05 in paper copy, A01 in microfiche. Washington State Highway Department, Olympia, Research Program Report 19.2, July 1976. 96 p, 30 fig, 17 ref, 3 append.

Descriptors: *Avalanches, *Snow management, *Snow, *Washington, Snowpacks, Snow cornice, Hazards, On-site investigations, Equipment, Vibrations, Interfaces, Snow cover, Model studies, Mathematical models, *Avalanche control, Air bags, Gas exploders, Vibrators.

This interim report summarized results from the second year of investigation into alternate methods of avalanche control. Four different methods of controlling snow avalanches were investigated. These methods are: (1) artificial release by inflation of air bags under the snow; (2) artificial release by exploding a gas-oxygen mixture in special containers placed under the snow (gas exploders); (3) artificial release by initiating fracturing in snow through vibration; and (4) modification of the snow-earth interface, either to inhibit avalanche formation or to enhance avlanching and prevent build-up of dangerous amounts of snow. During the second winter, field tests of these methods were made. Results of these tests were reported. Also, a mathematical model of the solutions for the interruption of the creep and glide of a snowpack by rigid structures was reported. Mechanical resonance of snow was investigated. (See also W77-05810) (Sims-ISWS)
W78-11441

COMPRESSIBILITY CHARACTERISTICS OF COMPACTED SNOW,
Cold Regions Research and Engineering Lab., Hanover, NH. Applied Research Branch.
G. Abele, and A. J. Gow.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-028 622, Price codes: A04 in paper copy, A01 in microfiche. CRREL Report 76-21, June 1976. 53 p, 38 fig, 1 tab, 5 ref, 1 append.

Descriptors: *Snow, *Compressibility, *Compressive strength, *Mechanical properties, Physical properties, Trafficability, Crystals, Crystalization, Crystallography, Ice, Stress, Density, Deformation, Compaction, Strength of materials, Temperature, Laboratory tests, Cold regions.

The effects of snow temperature and initial density on the stress vs density and stress vs deformation relationships were investigated for shallow compacted snow in the density range of 0.28 to 0.76 g/cu m, for a stress range of 0.5 to 72 bars and a temperature range of -1 to -34C at a deformation rate of 40 cm/s. A decrease in temperature increases the resistance to stress, the effect increasing with appied stress. For any stress, an increase in the initial density results in an increase in the resulting density, the effect decreasing with an increase in stress. The approximate yield envelopes,

which define the stress required to initiate any deformatin of snow of a particular density and temperature, were determined. Rapid compaction of snow resuls in extensive recrystallization, significantly different from that of naturaly compacted snow. At a stress of 72 bars, transformation to ice occurs only at temperatures above -19C, (See also W76-00537) (Sims-ISWS)
W78-11442

WINTER CURRENTS IN LAKE HURON,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W78-11445

EVALUATION OF FREEZE-THAW DURABILITY OF STABILIZED MATERIALS.
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8G.
W78-11874

INSULATED ROAD STUDY,
National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.
E. Penner.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification; Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington, D.C., p 80-83, 1976. 6 fig, 8 ref.

Descriptors: *Frost action, *Roads, *Canada, On-site tests, Frozen ground, Frost protection, Testing procedures, Soil moisture, Frost heaving, Insulation, Porous media, Soil temperature, Soils, Subgrade soil, Insulated road.

The results of a 3-year insulated road study showed that frost penetration inward from the edge of an insulated area is about the same as the downward penetration on a control section. Moisture accumulated in the frost-susceptible subgrade after the frost line penetrated the insulation. During periods of rapid cooling, the temperature of the surface above an insulated pavement may be lowered sufficiently to permit surface icing if atmospheric moisture conditions are suitable. Terminating the insulation without feathering induces abrupt changes in elevation in the roadway as a result of heaving. (See also W78-11865) (Humphreys-ISWS)
W78-11877

BRINE DRAINAGE AND CONVECTION IN YOUNG SEA ICE,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
T. M. Niedrauer.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-043 351, Price codes: A05 in paper copy, A01 in microfiche. Scientific Report No 15 to Office of Naval Research, July 1977. 80 p, 30 fig, 2 tab, 21 ref. N00014-76-C-0234.

Descriptors: *Sea ice, *Brines, *Albedo, *Baseline studies, Desalination, Water resources, Environments, Convection, Outer Continental Shelf, Environmental impacts, Brine channels.

In a series of experiments using a 1.6 mm thick freezing tank, thin sections of salt water ice were grown which exhibit the same drainage features as natural sea ice. The tank design permitted photographs to be taken, while thermocouples mounted in the tank walls recorded the temperature profiles within the ice. Convection was observed in both the skeleton layer and in the brine channels by the flow of dyed brine. Flow in the skeleton layer was cusp-like in appearance, consisting of narrow downflow regions separated by broad upflow regions. Several brine channels were usually present in the ice and convective overturning occurred in these channels. The convection caused temperature fluctuations of 0.05C, which calculations show increase the vertical heat flux by 2%. The brine drainage channels, which were usually sloped 30 to 60 degrees to the horizontal, always had isotherms tilted from 0 to 13 degrees in the same direction. The brine channels move both horizontally and vertically through the ice by melting their lower walls and freezing on the upper walls. An analysis based on the heat flux due to brine channel convection shows that convection can drive these wall movements. Observations suggest that most of the brine movement in the channels is caused by recirculation of water from below the ice. The formation of brine pockets from brine tubes was also observed. (Sinha-OEIS)
W78-11965

2D. Evaporation and Transpiration

ESTIMATING LAKE EVAPORATION WITH FLOATING EVAPORIMETERS AND WITH WATER BUDGET,
National Water Board of Finland, Helsinki. Hydrological Office.
J. Jarvinen.
Nordic Hydrology, Vol 9, No 2, p 121-130, 1978. 1 fig, 3 tab, 6 ref.

Descriptors: *Evaporation, *Lakes, *On-site investigation, On-site data collections, Analytical techniques, Water balance, Evaporation pans, Evaporimeters, Instrumentation, Measurement, Equations, Water loss, Foreign research, Winds, Temperature, Data processing, Limnology, *Finland.

A short review of the 4 lake evaporation research projects in Finland was given. Three of the lakes studied are situated in southern Finland and one in the north. One of the lakes is deep in Finnish terms, and the rest are shallow. The methods used and the results obtained in 1971-1974 also were discussed in this paper. The results were compared with those of a Class A pan station. (Sims-ISWS)
W78-11428

THE PROJECTED IMPACT OF WATER HYACINTH INFESTATION IN TEXAS,
Texas A and M Univ., College Station. Remote Sensing Center.
For primary bibliographic entry see Field 4A.
W78-11605

AN APPLICATION OF THE RUTTER MODEL TO THE ESTIMATION OF THE INTERCEPTION LOSS FROM THETFORD FOREST,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2A.
W78-11887

BRINE DRAINAGE AND CONVECTION IN YOUNG SEA ICE,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 2C.
W78-11965

HYDROLOGY OF THE NEVIN WETLAND NEAR MADISON, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-11972

2E. Streamflow and Runoff

PRELIMINARY RUNOFF AND STREAMFLOW PREDICTIONS IN THE HUMBOLDT RIVER BASIN BASED ON SNOW DISTRIBUTION MEASUREMENTS FROM SEQUENTIAL SATELLITE IMAGERY,
Nevada Univ. System, Reno. Renewable Natural Resources Div.
For primary bibliographic entry see Field 4A.
W78-11366

TAIL BEHAVIOUR OF RIVERFLOW PROBABILITY DENSITIES,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-11388

RELIABILITY OF PROBABILITY-DISTRIBUTED MODELS,
Universidade Federal do Rio de Janeiro (Brazil).
D. Machado.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 521-525, 1978. 6 ref.

Descriptors: *Reliability, *Stochastic processes, *Probability, *Streamflow, *Catchments, *Mathematical models, Risks, Optimization, Outflow, Estimating, Simulation analysis, Water resources, Planning, Sampling, Equations, Systems analysis, Lumped model, Distributed system, Sensitivity analysis, Uncertainty, Variability.

Optimization methods are challenged by various problems having no easy solution. One of these is that traditional methods of optimization are capable of providing only lumped best-fit parameter values, as if catchments were spatially homogeneous. This can lead to poor results in a forecasting procedure. The specification of a confidence interval for forecasted outflow values is of considerable importance. This work estimates an 'a priori' confidence interval for model simulated outflow under the hypothesis of the parameters being variables in a probabilistic sense and independent of each other. The method is based on the determination of the variance of a dependent variable as a function of the sampling variance of several independent variables. (See also W78-11386)
W78-11390

STOCHASTIC ANALYSIS OF THE RESIDUALS OF A CONCEPTUAL MODEL,
McGill Univ., Montreal (Quebec). Faculty of Management.
G. S. Cavadias, and S. K. Gupta.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 536-555, 1978. 9 fig, 6 tab, 4 ref, append.

Descriptors: *Stochastic processes, *Time series analysis, *Model studies, *Watersheds(Basins), *Streamflow, Hydrologic data, Simulation analysis, Methodology, Estimating, Regression analysis, Hydrologic cycle, Systems analysis.

The main justification for the establishment of research watersheds is the potential usefulness of the resulting data for understanding the complex relationships between the elements of the hydrologic cycle. To achieve this understanding, it is necessary to formulate adequate models for the relevant hydrological processes. For this purpose, various conceptual models have been fitted to the data from research basins. An analysis of the results of these studies indicates that the dif-

ferences between simulated and observed flows exhibit some patterns. This study analyzes these patterns using the methodology of univariate and multivariate time series analysis, in order to understand the limitations of the modeling process and improve the agreement between simulated and observed flows. The study approach is in the direction of combining conceptual and stochastic hydrological models whose separate development over the years has created considerable confusion in the minds of users as to the results of hydrological research. The combination of conceptual and stochastic models outlined herein seems to result in a clarification of the nature of the residuals of the conceptual model, and it may find various applications both in the planning and operation of water resource projects. (See also W78-11386) (Bell-Cornell)
W78-11391

STOCHASTIC MODEL OF A FLOOD FORECAST-RESPONSE PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4A.
W78-11401

POSTERIOR DISTRIBUTION OF THE PARAMETERS OF THE PEARSON TYPE III DISTRIBUTION; AN APPLICATION TO DESIGN FLOOD SERIES ANALYSIS,
Chile Univ., Santiago.
B. Espildora, F. J. Samaniego, and J. Amorocho.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 714-731, 1978. 12 ref.

Descriptors: *Design flood, *Parametric hydrology, *Estimating, *Probability, *Uncertainty, Risks, Decision making, Statistical methods, Constraints, Low flow, High flow, Equations, Mathematical models, Entropy, Maximization, Lagrange multipliers, Bayesian analysis, Systems analysis.

Decisions involved in the selection of criteria for water resources systems design often call for the stochastic modeling of hydrologic variables, such as the peak inflows entering a reservoir. These decisions must be made with the recognition that considerable uncertainties exist with respect to the appropriate form of the model, as well as to its structural parameters. This paper discusses a general method for the derivation of the posterior distribution of these parameters, representing the probability assigned to their values after sample information becomes available. This sample information is combined with knowledge previously available, as represented by a 'prior' probability distribution of the parameters, by application of the Bayesian method of analysis. Specifically, the solution proposed here is applicable to decision analyses in which a hydrologic variables is modeled as having a Pearson Type III distribution. Noninformative prior distributions are developed via entropy maximization. The risk of a given decision may thus be evaluated as the expected risk relative to the posterior distribution here outlined. (See also W78-11386) (Bell-Cornell)
W78-11402

THE RELIABILITY OF LOW FLOW REGIONAL EQUATIONS IN BRITISH COLUMBIA,
Water Survey of Canada, Vancouver (British Columbia). Planning and Studies Section.
R. M. Leith.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 733-747, 1978. 4 fig, 3 tab, 3 ref, 2 append.

Descriptors: *Reliability, *Estimating, *Low flow, *Least squares method, *Kalman filtering, Networks, Hydrometry, *British Columbia, Regional analysis, Statistical methods, Probability, Equations, Systems analysis, Physiographic parameters, Canada.

The reliability of estimates of low flows is examined by least squares fitting and Kalman filtering. These techniques applied to a network of hydrometric stations in British Columbia allow the contribution of individual stations to be assessed. The changes in reliability of estimates are studied as a function of the changes in the size of the network. The subdivision of the study area is examined by a split test sample with inconclusive results. Factors such as common time base of the data and season of occurrence of low flow are found to influence the accuracy of low flow estimates. (See also W78-11386) (Bell-Cornell)
W78-11403

STOCHASTIC MODELS OF EXTREME FLOWS AND THEIR APPLICATION TO DESIGN,
Montreal Univ. (Quebec). Ecole Polytechnique.
P. Todorovic.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 763-783, 1978. 4 fig, 19 ref, 3 append.

Descriptors: *Stochastic processes, *Extreme events, *Streamflow, *Mathematical models, Design, Equations, Hydrographs, Systems analysis, Seasonal, Variations, Bivariate point process, Poisson process.

Frequently in various investigations, considerations of stochastic models often involve different functionals of a bivariate point process. Considered herein are the definition and methods for analysis of such a process. Discussed are properties of this stochastic structure and the conditions under which it becomes a bivariate Poisson process. The distribution functions of several functionals (generally speaking, a functional of a stochastic process is a stochastic process) of this Poisson process are also given. The second part of the paper considers applications of the previous results in analysis of extreme flows. In this respect, two processes (functionals of the bivariate point process) are of particular interest. The First one chi(t) represents, roughly speaking, the largest of all exceedances in the interval of time (0,t) of a level xo by the streamflow hydrograph. The second process T(t) represents the time of the largest exceedance chi(t). The joint distribution function of these two processes is determined. Finally, some problems concerning the application of these results to problems of design are discussed. (See also W78-11386) (Bell-Cornell)
W78-11405

THE DISTRIBUTION OF THE EXTREME OF A MIXTURE RANDOM VARIABLE WITH APPLICATIONS IN HYDROLOGY,
Utah State Univ., Logan. Dept. of Applied Statistics and Computer Science.
R. V. Canfield.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 784-790, 1978. 8 ref.

Descriptors: Hydrology, *Streamflow, *Estimating, *Extreme events, Floods, Runoff, Distribution, Equations, Systems analysis, Graphical methods, Extreme value theory, Tail characteristics.

Present methods of estimating return periods and probabilities of flood events do not work well when runoff originates from nonhomogeneous sources. In this case, the random variable describing daily river height may be viewed as a mixed random variable. The most important consideration in selecting a distribution for use in describing maximum yearly river height is the behavior of the right tail of the distribution. It is from the right tail that return periods and probabilities of rare events are determined. Good empirical fit of a distribution to a data set is not sufficient to ensure that the chosen distribution can provide a good fit to a given tail. Unfortunately, many distributions can provide a good fit to a given data set with each having very different tail characteristics. Thus some theoretical principle is needed to assist in the choice of a distribution. Extreme value theory is used here as the guiding principle. Using an extension of the theory to mixture random variables, the extreme value approximation of distribution of maximum yearly river height F(h) is for two sources of runoff: F(h) = phi (h) phi i'(h) i,i' = 1,2,3 where phi i (h) and phi i'(h) are classical extreme value distributions of which there are only three different types. In addition to narrowing the choice of distributions down to three types, the tail characteristic of these types are very different which further simplifies the problem of choice. Estimation of the parameters of F(h) is considered for one choice of extreme value type. (See also W78-11386) (Bell-Cornell)
W78-11406

ANALYSIS OF EXTREME EVENTS IN STATIONARY DEPENDENT SERIES,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
D. Rosbjerg.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978. 3 fig, 5 ref.

Descriptors: Hydrology, *Time series, *Markov processes, *Value, *Distribution, *Extreme events, Annual, Streamflow, Sampling, Equations, Probability, Mathematical models, Systems analysis, Long-term records.

In order to obtain an extreme value distribution corresponding to discrete stationary dependent series, an approximate first-order Markov process is considered. On the basis of this model, which supposed to be good for moderately persistent series, the distribution function for the maximum value of the process in a given interval of time is developed. A strongly persistent discrete series can be approximated by a continuous one for the purpose of making use of the extreme value distribution for stationary continuous processes developed by Ditlevsen (1971). However, comparison of the two extreme value distributions in this case shows nearly identical results, indicating that the developed extreme value distribution can be used not only for moderately persistent series, but in all cases as well. The theoretical extreme value distribution is compared with extreme values obtained from long-term annual streamflow records, showing good agreement. Finally, some comments concerning loss of information about the extreme events due to discrete sampling are given. (See also W78-11386) (Bell-Cornell)
W78-11407

A NONPARAMETRIC APPROACH TO THE ANALYSIS OF EXTREME HYDROLOGIC EVENTS,
Washington Univ., Seattle. Dept. of Civil Engineering.
D. P. Lettenmaier, and S. J. Burges.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Canada, June 26-28, 1978, p 799-818, 1978. 4 fig, 3 tab, 11 ref.

Descriptors: Hydrology, *Optimization, *Linear programming, *Extreme events, *Estimated mo-

ments, Constraints, Monte Carlo method, Error, Maximization, Sensitivity analysis, Exceedance probabilities, Confidence bounds, Mathematical models, Equations, Systems analysis, *Floods.

Many planning and design problems require estimates of the magnitude of extreme hydrologic events. Current practice involves fitting of an analytical distribution to an observed sequence of extremes. The fitted distribution is then interpolated or, more commonly, extrapolated to the return period of interest. Error is inherent in both distribution choice and parameter estimation. An alternative method which eliminates the necessity for distribution identification is explored herein. The approach is based on a linear programming formulation for the maximum and minimum exceedance probabilities of an (artibrary) distribution with a given set of moments taken as constraints. The probability density function is approximated as a cubic spline fit at a pre-specified set of nodes, where the distribution is constained only to have the given moments and to be unimodal with two given inflections and positive curvature in both tails. The method requires that the user specify (1) the number of nodes to be used, (2) node allocation to event levels, and (3) inflection locations. Exploratory Monte Carlo tests, conducted using samples of size 30 drawn from an Extreme Value Type I distribution with Cv = 0.6, showed that the upper 68% and 90% maximum exceedance probabilities derived from repeated use of the linear programming approach agreed closely with the upper parametric confidence bounds for the Extreme Value Type I distribution. Although preliminary, the results suggest that more detailed documentation of the approach as a possible alternative to present practice is warranted. (See also W78-11386) (Bell-Cornell)
W78-11408

A NON-GAUSSIAN STOCHASTIC MODEL FOR DESIGN-EXTREMES OF WATER RESOURCES SYSTEMS,
Technical Univ. of Lisbon (Portugal).
L. V. Tavares.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds), University of Waterloo, Waterloo, Canada, June 26-28, 1978, p 819-830, 1978. 5 tab, 2 fig, 5 ref.

Descriptors: Hydrology, *Stochastic processes, Water resources, *Systems analysis, *Extreme events, Design, Equations, Rivers, Behavior, Distribution, Sensitivity analysis, Return periods, Autocorrelation, Daily, Runoff, Mathematical models, Simulation analysis.

The development of models for autocorrelated extremes has to be obtained in order to improve its design and management. However, most results of the Theory of Extremes have been obtained either for random variables (e.g., Gumbel, 1958) or for gaussian processes (e.g., Cramer & Leadbetter, 1967 and Qualls & Watanable, 1975) and therefore in applied studies either the autocorrelation or the non-gaussian behavior of the exogenous magnitudes is usually ignored. In this paper, the exact distribution of extremes of a non-gaussian stationary discrete process is obtained and their crossing intervals are studied in terms of the autocorrelation coefficients for any level of crossing. Thus a sensitivity analysis of the expected return periods and of their variances in relation to the autocorrelation coefficients can be accomplished using the results presented herein. Finally, a successful application of this process to the modeling of daily runoff for a Portuguese River is considered. (See also W78-11386) (Bell-Cornell)
W78-11409

ON THE PREDICTION OF EXTREME FLOWS,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering.
M. Grigoriu.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 831-852, 1978. 10 fig, 3 tab, 16 ref.

Descriptors: *Flood protection, *Runoff, *Extreme flows, *Statistical methods, Markov processes, Measurement, Probability, Daily, Rivers, Runoff coefficient, Equations, Systems analysis, Prediction, Random sequences, Tirgua River(Venezuela).

A method for extreme flood analysis using all available measurements of a runoff series is developed. An approximation of the distribution of the extremes of correlated random sequences is formulated based on the crossing approach. It is shown that the correlation of Gauss-Markovian runoffs can be generally ignored in flood analysis. The independence hypothesis replacing the original series by a white sequence of identical marginal probability law is also tested with satisfactory results against actual data in the Tirgua River, Venezuela. The proposed method for flood prediction seems to perform suitably even in the case of rivers observed for short periods; it features computational simplicity. (See also W78-11386) (Bell-Cornell)
W78-11410

INCORPORATION OF FORECASTED TOTAL SEASONAL RUNOFF VOLUMES INTO RESERVOIR MANAGEMENT STRATEGIES,
Hokkaido Univ., Sapporo (Japan). Dept. of Civil Engineering.
K. Hoshi, and S. J. Burges.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 853-872, 1978. 7 fig, 8 tab, 15 ref.

Descriptors: *Reservoir operation, *Streamflow forecasting, *Runoff, *Multiple-purpose reservoirs, Seasonal, Volume, Probability, Linear programming, Hydrologic data, Pacific Northwest, U.S., Reservoir releases, Constraints, Economic efficiency, Optimization, Benefit maximization, Mathematical models, Equations, Systems analysis, Snowmelt, Chance-constrained programming, Cedar River(Washington), Multiple objectives, Decision rules.

Forecasts of total snowmelt seasonal runoff volumes were used to determine rules for hypothetical reservoirs to determine the relative advantage of using forecasted flow over the unconditional flow state. Comparisons were made using chance-constrained linear programming (CCLP) formulations for the operation of a single multiple-purpose reservoir (flood mitigation, water supply, and hydropower generation) with and without snowmelt runoff forecasts. Two reservoir sizes, one approximately 20% and the other 100% of the mean annual flow of a river, were examined. Flow data from the Cedar River, Washington, were used to reflect runoff patterns typical of much of the Pacific Northwest region. Conditional streamflow distributions for months March-August were developed for given total March-August runoff volume amounts. These conditional distributions were used to develop Linear Decision Rules (LDR's) for release from the reservoir. LDR's were also developed for the maximum ignorance state. Economic benefits were computed for maximum ignorance operating rules (Type A), Type A operating rules with conditional inflows (Type B), and LDR's and benefits based on the conditional flows (Type C). In general, under Type C operation there was less uncertainty in the cumulative distribution of water supply and reservoir freeboard (surrogate for flood control) than when Type A operation was used. Explicit inclusion of the total seasonal runoff forecast into reservoir operation reduces physical operating uncertainty and generates larger benefits than are determined by operating under circumstances of maximum ignorance, i.e., where only unconditional streamflow distributions are available. (See also W78-11386) (Bell-Cornell)
W78-11411

APPLICATION OF FEATURE PREDICTION MODEL IN HYDROLOGIC TIME SERIES SYNTHESIS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
U. S. Panu, and T. E. Unny.
Supplemental article: Abstract only, in: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978. 20 p, 4 fig, 6 tab, 16 ref. (Reprint available from author).

Descriptors: *Streamflow, *Stochastic processes, *Time series analysis, *Statistical methods, *Watersheds(Basins), *Markov processes, *Hydrologic data synthesis, Performance, Evaluation, Mathematical models, Rivers, Canada, Computer programs, Distribution, Monthly, Extreme value, Prediction, Pattern structure, Equations, Algorithms, Systems analysis.

A procedure is developed to incorporate multivariate normal distribution for the intra-pattern structure and first order Markovian dependence for the inter-pattern structure in the application of the Feature Prediction model for streamflow synthesis. Synthesized streamflow realizations for a large size watershed (Fraser River) and for a small size watershed (Black River) are found very satisfactory under various tests. The synthesized realizations are found embedded with properties associated with the sequence of low flows (critical period) and also with the sequence of peak flows (extreme-value probability distribution) that are comparable with the corresponding properties possessed by the historical sample. Although more available, only the first 30 years of streamflow for each river have been used, since historical records usually available are characteristically of this duration. (See also W78-11386) (Bell-Cornell)
W78-11416

INCREASED RELIABILITY OF LOW WATER ANALYSES THROUGH SIMULATION OF TIME SERIES,
Coblenz Federal Inst. of Hydrology (West Germany).
G. Huthman, and H.-J. Liebscher.
Supplemental article: Abstract only (p 713), in: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978. 14 p, 8 fig, 2 tab, 10 ref. (Reprint available from author).

Descriptors: *Low flow, *Reliability, *Time series analysis, *Simulation analysis, Hydrographs, Daily, River flow, Frequency analysis, Drainage areas, Rivers, Germany, Uncertainty, Linear systems, Fourier transform, Equations, Mathematical models, Systems analysis.

This study was undertaken in order to increase the reliability of low water analyses from short data series where the evaluation of extreme values does not provide a proven basis for planning. By simulating discharge hydrographs, an attempt has been made to extend the available data series without modifying the statistical parameters; a compound procedure is introduced which is based on multiple frequency response analysis and linear ARMA processes and which allows the utilization of information from discharge hydrographs of neighboring areas where hydrologically and climatologically similar conditions prevail. The simulation results for the low water range are compared to the results obtained with the simulation procedure based on

the separation of the mean annual variation and the subsequent superposition by an AR process. The improvement of the simulation process with the aid of the procedure described herein considerably increases the reliability of low water analyses. (See also W78-11386) (Bell-Cornell)
W78-11418

CRITICAL DROUGHT REVISITED,
University of Western Ontario, London. Dept. of Mathematics.
A. I. McLeod, and K. W. Hipel.
Supplemental article: Abstract only, in: Proceedings, Volume II, p 732, 'International Symposium on Risk and Reliability in Water Resources.' E. A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978. 17 p, 5 tab, 13 ref, append. (Reprint available from author).

Descriptors: *Droughts, *Time series analysis, *Model studies, Hydrology, *River flow, *Simulation analysis, Reservoir design, Reservoir operation, Stochastic processes, Monthly, Equations, Systems analysis, Parameter estimation.

A family of monthly hydrological (MHD) models is presented for modeling natural time series. Tha Akaike information criterion is suggested as a means for selecting which type MHD mode to fit to a given data set. MH processes are determined for 25 monthsly riverflow time series and it is shown using simulation procedures that these models adequately preserve the critical period statistics. Consequently, MH models can be used for reservoir design and operation. (See also W78-11386) (Bell-Cornell)
W78-11419

ANALYSIS OF HYDROLOGIC DATA USING PEARSON TYPE III DISTRIBUTION,
Central Water and Power Research Station, Poona (India).
V. M. Shaligram, and V. S. Lele.
Nordic Hydrology, Vol 9, No 1, p 31-42, 1978. 1 fig, 4 tab, 4 ref.

Descriptors: *Flood frequency, *Frequency curves, *Statistical methods, Hydrologic data, Rivers, Distribution patterns, Estimating, Numerical analysis, Prototypes, *Extreme value distribution, *Pearson type III distribution, Confidence intervals, Skewed data.

Historical annual floods for 15 rivers in India and one stream in the U.S. were utilized for deriving long-term estimates using maximum likelihood method with extreme value distribution. The results showed that most peak flows were under estimated, and their departures from respective prototype magnitudes were of the order of 10 to 40%. These flood sequences also were analyzed using Pearson type III distribution. The departures were significantly reduced. However, the confidence intervals were larger with the Pearson type than with the extreme value distribution. The hydrologic data, in general, is skewed, and the use of Pearson type III distribution improves the goodness of fit of the prototype and model values, though at the expense of slightly less precise estimates. (Singh-ISWS)
W78-11423

STREAM BOTTOM SEDIMENTATION IN ILLINOIS RIVERS: PRELIMINARY EVALUATION ON USGS GAGING STATION DATA,
Northern Illinois Univ., DeKalb. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W78-11440

STREAMFLOW MODELING OF UPPER INDUS RIVER CATCHMENTS,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Resources Engineering.
For primary bibliographic entry see Field 2A.
W78-11881

A QUASI-LINEAR SPATIALLY DISTRIBUTED CELL MODEL FOR THE SURFACE RUNOFF SYSTEM,
Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-11882

FLOW GENERATION BY CATCHMENT MODELS OF DIFFERING COMPLEXITY - A COMPARISON OF PERFORMANCE,
University of the Witwatersrand, Johannesburg (South Africa). Hydrological Research Unit.
W. V. Pitman.
Journal of Hydrology, Vol 38, No 1/2, p 59-70, July 1978. 3 fig, 4 tab, 4 ref.

Descriptors: *Africa, *Watersheds(Basins), *Model studies, Mathematical models, Streamflow, Rainfall-runoff relationships, Hydrology, Water storage, Water yield, Monthly, Catchment models, Statistical tests.

Four deterministic rainfall-runoff models of differing degrees of complexity were tested with a data set derived from a comparatively well-instrumented catchment in South Africa. A comprehensive set of statistical tests on simulated monthly flows indicated that the simple models based on daily or monthly input performed quite as satisfactorily as the complex models which rely on hourly input. Therefore, it was concluded that models utilizing daily or even monthly input would be adequate in water resources studies where storage-yield determinations can be based on monthly data. (Lee-ISWS)
W78-11888

SEQUENTIAL GENERATION OF MONTHLY STREAMFLOWS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
R. Srikanthan.
Journal of Hydrology, Vol 38, No 1/2, p 71-80, July 1978. 2 fig, 2 tab, 9 ref, 1 append.

Descriptors: *Streamflow, *Model studies, *Mathematical models, Flow, Monthly, Annual, Analytical techniques, Streams, Rivers, Data processing, Hydrology, Climatology.

A possible modification to the disaggregation scheme proposed by Valencia and Schaake to generate skewed monthly streamflows was suggested. The modified procedure was applied to two Australian streams, and the results were compared with those of the two-tier model of Harms and Campbell. It was concluded that either one of the methods can be used to generate streamflows sequentially. The advantage of using a two-tier model for a single site is that it is simple and can be applied to almost all streams. The disaggregation scheme does not preserve the skewness of the last month flow, and its use is limited in certain cases where the skewness of the random variables becomes very large. (Sims-ISWS)
W78-11889

COMPARISON OF EAST FRACTIONAL GAUSSIAN NOISE AND BROKEN LINE MODELS FOR GENERATING ANNUAL FLOWS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-11890

FLOODS IN WESTERN NORTH CAROLINA, NOVEMBER 1977 - A LESSON FOR THE FUTURE,
North Carolina Water Resources Research Inst., Raleigh; Geological Survey, Raleigh. Water Resources Div.; and North Carolina Dept. of Natural Resources and Community Development, Raleigh.
J. M. Stewart, R. C. Heath, and J. N. Morris.
North Carolina Water Resources Research Institute of the University of North Carolina, 1978. 24 p, 4 fig, 1 tab.

Descriptors: *Floods, *Flood damage, *Peak discharge, *Flood data, *North Carolina, Yancey County, Ashe County, Sixteen-county area.

Floods on November 5 and 6, 1977, affected a 16-county area of about 9,000 square miles in the western part of North Carolina. The most serious flooding occurred in two areas totaling about 1,800 square miles; one centered on Yancey County and the other on Ashe County. Flood peaks in these areas were at or near record levels. Peaks in the remainder of the 7,200 square-mile area were well below the maximums of record. Thirteen lives were lost and damage exceeded 50 million dollars, making this one of the worst floods to hit North Carolina in terms of lives lost and property damage. This report describes the November flood and the damage it caused, compares the November flood to other large floods, and mentions the flood-related programs of Federal, State, and local agencies. (Woodard-USGS)
W78-11973

FLOOD PROFILES FOR CYPRESS CREEK, WEST-CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11987

PROGRESS REPORT ON HYDROLOGIC INVESTIGATIONS OF SMALL DRAINAGE AREAS IN NEW HAMPSHIRE--PRELIMINARY RELATIONS FOR ESTIMATING PEAK DISCHARGES ON RURAL, UNREGULATED STREAMS,
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-11988

EFFECTS OF FOREST AND AGRICULTURAL LAND USE ON FLOOD UNIT HYDROGRAPHS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
W. Sangvaree, and V. Yevjevich.
Hydrology Paper No 92, July 1977. 29 p, 19 fig, 31 tab, 31 ref, 3 append. OWRT A-002-COLO(21).

Descriptors: *Unit hydrographs, *Land use, *Forests, *Agricultural runoff, *Central US, *Southeast US, Agricultural watersheds, Watersheds(Basins), Storm runoff, Flood peak, Slopes, Rain, Regression analysis, Peak discharge, River basins, Hydrologic properties, Geomorphology, Flood hydrographs, Gamma function.

The effects of forest and agricultural land uses on flood unit hydrographs of small catchments was the subject of this paper. A total of 105 floods from small catchments was used in the study, of which 8 are predominantly forest and 14 predominantly agricultural land-use catchments, with areas ranging from 0.12 to 7.19 sq mi, situated in the eastern and central United States. Floods were caused by rainstorms of less than 6 hours duration. Derived unit hydrographs of flood events are affected by non-uniform distribution of rainfall. It was found that the same representative, unit hydrograph peak flow equation is applicable to both forest and agricultural land-use catchments.

The average rise time, T sub a, is mainly dependent on land use and catchment physiographic factors A (area), S sub H (slopes), H (total fall), F sub 1 and C sub f (percentage of forest cover). A concept of representative catchment, equal for all the studied river basins, was introduced to separate the effects of geometry from those of land use. For a given small catchment, the agricultural land use means a greater flood peak with a faster surface runoff, while the forest land use means a smaller flood peak with a surface runoff. (Visocky-ISWS)
W78-12011

2F. Groundwater

GROUNDWATER PROTECTION IN THE CHRISTINA BASIN,
Pennsylvania Univ., Philadelphia. Center for Ecological Research in Planning and Design.
For primary bibliographic entry see Field 4B.
W78-11315

HYDROLOGY AND GROUND WATER SUPPLY OF THE BOISE AREA,
Boise Center for Urban Research, ID.
For primary bibliographic entry see Field 4B.
W78-11444

MECHANISMS OF SUBSIDENCE DUE TO UNDERGROUND OPENINGS,
Georgia Inst. of Tech., Atlanta. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W78-11866

INDUCED AND NATURAL SINKHOLES IN ALABAMA CONTINUING PROBLEM ALONG HIGHWAY CORRIDORS,
Geological Survey, Tuscaloosa, Al., Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-11867

SUBSIDENCE CONTROL FOR STRUCTURES ABOVE ABANDONED COAL MINES,
GAI Consultants, Inc., Monroeville, PA.
For primary bibliographic entry see Field 4B.
W78-11868

GROUND SUBSIDENCE ASSOCIATED WITH DEWATERING OF A DEPRESSED HIGHWAY SECTION,
California Dept. of Transportation, Sacramento. Office of Transportation Lab.
For primary bibliographic entry see Field 4B.
W78-11869

GEOLOGIC INDICATORS OF CATASTROPHIC COLLAPSE IN KARST TERRAIN IN MISSOURI,
Missouri Dept. of Natural Resources, Rolla. Div. of Geology and Land Survey.
J. H. Williams, and J. D. Vineyard.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification; Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington, D.C., p 31-37, 1976. 4 fig, 31 ref.

Descriptors: *Geologic formations, *Karst, *Collapse, *Missouri, Reviews, Subsidence, Land subsidence, Sinks, Carbonate rocks, Geology, Bedrock, Weathering, Limestones, Surveys, Indicators, Geologic indicators.

Althought the records of 97 catastrophic collapses in Missour karst terrain have emphasized such man-made causes as dewatering, vibration, or water saturation, there is an underlying commonality of geologic features that offers insight into ways to avoid collapse problems in highway and other construction. Collapse events are more likely to occur in areas overlain by moderately thick residual soil, in losing valleys, and in wet seasons. Significant collapses have occurred where there was no indication of sinkholes or other typical karst landforms. Of the numerous collapses related to highway construction, most have involved upward stopping of residum from underlying cavernous channels in carbonate bedrock, and have been triggered byconstructional or operational activities that altered drainage conditions. Exploration for incipient collapses is costly and more effective in limited areas. Analysis of geologic indicators such as losing steams, relict karst landforms, and residuum type and thickness, as well as speleological data offer more cost-effective techniques to define target locales for subsequent detailed exploration. Initial exploration with a backhoe generally gives more useful near-surface data than drilling. Drilling is necessary, however to validate evidence inferred by surface geologic indicators and geophysical methods such as fixed-depth resistivity and high-precision gravity surveys. (See also W78-11865) (Humpreys-ISWS).
W78-11870

SUBSURFACE CAVITY DETECTION: FIELD EVALUATION OF RADAR, GRAVITY, AND EARTH RESISTIVITY METHODS,
Southwest Research Inst., San Antonio, TX.
For primary bibliographic entry see Field 7B.
W78-11871

MATHEMATICAL MODEL FOR PREDICTING MOISTURE MOVEMENT IN PAVEMENT SYSTEMS,
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-11872

UNSATURATED TRANSIENT AND STEADY-STATE FLOW OF MOISTURE IN SUBGRADE SOIL,
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-11873

EFFECT OF THE INERTIA TERM IN ONE-DIMENSIONAL FLUID FLOW IN DEFORMABLE POROUS MEDIA,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
P. Basak, and M. R. Madhav.
Journal of Hydrology, Vol 38, No 1/2, p 139-146, July 1978. 3 fig, 7 ref.

Descriptors: *Groundwater movement, *Porous media, *Model studies, Mathematical models, Unsteady flow, Steady flow, Darcy's law, Pore pressure, Groundwater, Hydralic conductivity, Equations, Mathematics, Hydrology.

An analytical investigation to study the effect of inertial forces on the one-dimensional fluid flow in deformable porous media caused by a sudden increase in external stress was presented. The solutions showed that the presence of an inertial force leads to higher excess piezometric pressure and a slower subsidence rate in the early stages. However, in terms of magnitude, the effect seems to be insignificant. (Sims-ISWS)
W78-11892

ANALYTICAL SOLUTIONS FOR TWO-REGIME WELL FLOW PROBLEMS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
P. Basak.
Journal of Hydrology, Vol 38, No 1/2, p 147-159, July 1978. 6 fig, 1 tab, 27 ref.

Descriptors: *Mathematical models, *Equations, *Aquifers, *Water wells, *Penetration, Darcys law, Steady flow, Reynolds number, Velocity, Energy gradient, Particle size, Artesian heads, Two-regime flow, Non-Darcy flow, Partial penetration.

Steady-state analytical solutions to the problems of fully penetrating and nonpenetrating wells, incorporating the concept of the existence of a non-Darcy flow regime around the well and a Darcian flow regime away from the well, were presented. For these problems, the exact distances to which the non-Darcy flow extends were quantified. The consequences of neglecting non-Darcy flow regime around the well in the estimation of piezometric heads and discharge (or flux) were made clear and discussed. (Visocky-ISWS)
W78-11893

FLOW AGAINST DISPERSION IN ADSORBING POROUS MEDIA,
California Univ., Davis. Dept. of Land, Air and Water Resources; and California Univ., Davis. Dept. of Civil Engineering.
M. A. Marino.
Journal of Hydrology, Vol 38, No 1/2, p 197-205, July 1978. 18 ref, 1 append. CSRS CA-D*-WSE-3081-H, CA-D*-WSE-3461-H.

Descriptors: *Mathematical models, *Porous media, *Adsorption, *Groundwater movement, Aquifers, Dispersion, Solutes, Equations, Mass transfer, Model studies, Concentrations, One-dimensional flow.

A mathematical analysis was presented of simultaneous dispersion and adsorption of a solute within finite porous media with flow and dispersion in opposite directions. The dispersion systems are adsorbing the solute at rates proportional to their concentration. The flow is assumed to be one-dimensional in a horizontal direction. Concentrations varying as exponential functions of time are enforced at the source of the dispersion, while a condition in which the change in concentration is proportional to the flow is applied at the other boundary. Different forms for the solutions were given to facilitate the computation of particular values. The solutions are useful for quantitatively predicting the possible control of spreading of poor quality water by freshwater flow. (Visocky-ISWS)
W78-11894

HYDRAULIC CONDUCTIVITY OF ROCKFILL,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
J. A. McCorquodale, and A. A. A. Hannoura.
Journal of Hydraulic Research, Vol 16, No 2, p 123-137, 1978. 8 fig, 2 tab, 27 ref.

Descriptors: *Hydraulic conductivity, *Rock fill, *Equations, Gravels, Permeameters, Reynolds number, Darcys law, Hydraulic radius, Hydraulics, Mathematical studies, *Non-Darcy flows, River gravels, Darcy friction factor.

Dimensionless equations for the hydraulic conductivity of crushed rock and river gravel were developed on the basis of approximately 1,250 permeameter tests. Experimental data of a number of researchers were used in the correlations. Grain sizes varied from 0.55 to 0.79 mm, and pore Reynolds numbers were in the range of 0.001 to 20,000. The data were divided into two flow regimes, and separate equations were proposed for each regime. Surface roughness was incorporated in the equations for high Reynolds number regime. The correlations also account for the wall effect. (Lee-ISWS)
W78-11896

POROUS MEDIUM DEFORMATION IN MULTIPHASE FLOW,
Princeton Univ., NJ. Dept. of Civil Engineering.
J. Bear, and G. F. Pinder.
Journal of the Engineering Mechanics Division, American Society of Civil Engineers, Vol 104, No EM4, Proceedings Paper 13926, p 881-894, August 1978. 1 fig, 1 tab, 13 ref. NSF-ENG 75-16072,ERDA W-7405-ENG.48.

Descriptors: *Consolidation, *Deformation, *Porous media, Fluid mechanics, Elasticity(Mechanical), Subsidence, Mathematical models, Equations, Surface tension, Two-phase flow, Displacement.

The deformation of a porous medium occupied by more than one fluid phase can be described using classical point equations integrated over the porous medium. The resulting system of governing equations was expressed in terms of macrascopic variables that have precise mathematical and physical definitions. It was found that the momentum balance for the entire porous medium contains terms involving surface tension that have heretofore been neglected. (Visocky-ISWS)
W78-11897

MAPS SHOWING GROUND-WATER CONDITIONS IN THE WILLCOX AREA, COCHISE AND GRAHAM COUNTIES, ARIZONA--1975,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11967

MAPS SHOWING GROUND-WATER CONDITIONS IN THE YUMA AREA, YUMA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11968

MAPS SHOWING GROUND-WATER CONDITIONS IN THE EASTERN PART OF THE SALT RIVER VALLEY AREA, MARICOPA AND PINAL COUNTIES, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11969

MAPS SHOWING GROUND-WATER CONDITIONS IN THE WESTERN PART OF THE SALT RIVER VALLEY AREA, MARICOPA COUNTY, ARIZONA--1977,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11970

AVAILABILITY OF GROUND WATER IN THE PISCATAQUA AND OTHER COASTAL RIVER BASINS, SOUTHEASTERN NEW HAMPSHIRE,
Geological Survey, Concord, NH. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11971

HYDROLOGY OF THE NEVIN WETLAND NEAR MADISON, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
R. P. Novitski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 118, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-48, June 1978. 25 p, 7 fig, 3 tab, 14 ref.

Descriptors: *Wetlands, *Hydrologic budget, *Water quality, *Sedimentation, Inflow, Discharge(Water), Evapotranspiration, Groundwater movement, Precipitation(Atmospheric), Phosphorus, Nitrogen, *Wisconsin, *Nevin wetland(Wisc).

The Nevin wetland near Madison, Wis., is an area of ground-water discharge. Ground water enters the wetland as springflow and as leakage upward through the organic wetland soils. The average annual water budget was based on the 3 years 1974 through 1976. Inflow was composed of direct precipitation (7 percent), surface-water inflow (4 percent), and ground-water inflow (89 percent). Outflow from the wetland was composed of streamflow (92 percent) and evapotranspiration (8 percent). Some ground water flowed beneath the wetland but did not discharge within the study area. Ground-water inflow contained 95 percent of the nitrogen that entered the wetland, precipitation contained 2 percent, and surface-water inflow contained 3 percent. Sixty-six percent of the phosphorus input was from ground water, 31 percent from surface water, and 3 percent from precipitation. The wetland retained 21 percent of the nitrogen and 7 percent of the phosphorus that entered. It also retained 80 percent of the sediment that entered. (Woodard-USGS)
W78-11972

GROUND WATER-SURFACE WATER RELATIONS IN THE SILVER CREEK AREA, BLAINE COUNTY, IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-11978

GROUND-WATER STORAGE IN THE JOHNSON VALLEY AREA, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-11984

APPRAISAL OF SHALLOW GROUND-WATER RESOURCES AND MANAGEMENT ALTERNATIVES IN THE UPPER PEACE AND EASTERN ALAFIA RIVER BASINS, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-11985

GEOHYDROLOGIC DATA FROM THE JEMEZ MOUNTAINS AND VICINITY, NORTH-CENTRAL NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11986

2G. Water In Soils

FATE OF TRACE ELEMENTS IN SEWAGE SLUDGE-AMENDED SOILS,
Dayton Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W78-11363

SNOWMELT-FROZEN SOIL CHARACTERISTICS FOR A SUBARCTIC SETTING,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 2C.
W78-11377

HYDRAULIC CONDUCTIVITY OF SOILS: UNIFIED APPROACH TO THE STATISTICAL MODELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
Y. Mualem, and G. Dagan.
Soil Science Society of America Journal, Vol 42, No 3, p 392-395, May-June 1978. 12 ref. NSF ENG-7611542.

Descriptors: *Hydraulic conductivity, *Soils, *Statistical models, Unsaturated flow, Porous media, Soil moisture, Pore pressure, Equations, Mathematical models, Darcy's law, Tortuosity, Relative permeability.

Conceptual theory of the hydraulic conductivity of unsaturated porous media was presented. This analysis permits the systematic derivation of the models of E.C. Childs and N. Collis George, M.R.J. Wyllie and G.H.F. Gardner, and Y. Mualem, as well as other existing and new versions, from common statistical principles. The resulting formulas of unsaturated hydraulic conductivity can be classified into three categories: (1) universal formulas independent of the soil type which result from extremely simplifying assumption; (2) formulas with one type which result from extremely simplifying assumptions; (2) formulas the one degree of freedom, and (3) formulas with two degrees of freedom. The latter two types of equations result from accounting for the correlation between pores and the tortuosity of flow path. These formulas can be adjusted to soil type to represent better the variability of soil properties and to increase the accuracy of the predicted hydraulic conductivity. However, in this stage it is a potential advantage only. Empirical study should be followed in order to derive the optimal methods of estimating the unknown parameters. (Visocky-ISWS)
W78-11420

AN IMPROVED SOIL-SAMPLING PROCEDURE FOR THE PREDICTION OF DISSOLVED INORGANIC PHOSPHATE CONCENTRATIONS IN SURFACE RUNOFF FROM PASTURE,
Massey Univ., Palmerston North (New Zealand). Agricultural and Horticultural Sciences.
For primary bibliographic entry see Field 5A.
W78-11432

DAMS ON PERMAFROST,
For primary bibliographic entry see Field 8D.
W78-11435

APPROXIMATE METHOD OF CALCULATING THE TEMPERATURE STEADY STATE OF WATER-PERMEABLE DAMS,
For primary bibliographic entry see Field 8D.
W78-11436

METHOD FOR THE STUDY OF INFILTRATION UNDER FIELD CONDITIONS: FIRST RESULTS,
A. Feodoroff.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 278, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 649, October 1977. 18 p, 8 fig, 1 tab, 12 ref. Translation of Communication at the International Symposium on Erosion, Prague (Czechoslovakia), p 19-29, June 1970.

Descriptors: *Infiltration, *Soil moisture, *Drainage, On-site investigations, Model studies, Measurement, Rainfall, Precipitation(Atmospheric), Tensiometers, Pressure, Soil water, Percolation, Soils, Soil science.

The method consistes of estimating the penetration of rainwater by the reaction of tensiometers located at different depths. The method permits

calculating the rates of infiltration and of drainage (or of redistribution) as well as the extent of saturation of the soil by the feedwater. At a second stage, these results can be related to the characteristics of the soil (porosity), initial moisture content, water deficit) and to the rainfall intensity. (Sims-ISWS)
W78-11437

SOIL MOISTURE TRANSPORT DURING THE 1974-1975 AND 1975-1976 WATER YEARS,
Atlantic Richfield Hanford Co., Richland, WA.
G. V. Last, P. G. Easley, and D. J. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as ARH-ST-146, Price codes: A08 in paper copy, A01 in microfiche. Report ARH-ST-146, December 1976. 150 p, 77 fig, 39 tab, 7 ref, 3 append. ERDA EY-76-C-06-2130.

Descriptors: *Soil moisture, *Soil water movement, *Percolation, *Washington, Lysimeters, Soil moisture meters, Nuclear moisture meters, Infiltration, Evaporation, Seasonal, Wetting, Soil water, Data collections, Climatology, Soil science.

The rate and direction of soil moisture movement in Hanford sediments were determined for the 1974-1975 and 1975-1976 water years. The data for these determinations were obtained from 2 large lysimeters located on the 200 Area plateau near the center of the Hanford reservation. During the 1974-75 water year, meteoric moisture percolated to a depth of 2.5 m with a peak moisture content of 10.5 volume-percent. This percolation envelope was eliminated by evaporation during the hot dry summer of 1975. The 1975-76 water year had only 70% of the normal precipitation, thus the percolation envelope was small and penetrated to a depth of only 2 m. However, in spite of this shallow depth and low volume of moisture, the percolation envelope was not eliminated by the end of the water year because of lower seasonal temperatures and higher humidity during the drying season. Moisture content of sediments in the 4-18 m depth showed no relative change throughout the 2 water years, and no moisture accumulated at the bottom of the lysimeters, which indicates that there is no deep percolation of meteoric moisture at this site and no recharge to the groundwater. (Sims-ISWS)
W78-11447

CALIBRATION OF SELECTED INFILTRATION EQUATIONS FOR THE GEORGIA COASTAL PLAIN,
Agricultural Research Service, Beltsville, MD. Plant Physiology Inst.
W. Rawls, P. Yates, and L. Asmussen.
Report ARS-S-113, July 1976. 110 p, 2 fig, 8 tab, 25 ref, 1 append.

Descriptors: *Infiltration, *Coastal Plain, *Georgia, Calibrations, Soils, Infiltration rates, Soil moisture, Soil profiles, Moisture tension, Rainfall, Equations, *Infiltration equations, *Georgia Coastal Plain.

Experimental infiltration data were obtained for 11 Coastal Plain soils. A total of 77 infiltration runs were made. Initial soil-moisture measurements, detailed soil-profile descriptions, and moisture-tension measurements also were made. The final infiltration rates ranged between 0.12 in/h and 4.61 in/h (0.30-11.71 cm/h) for all soils except Kershaw. At a rainfall application rate of 6.25 in/h (15.88 cm/h), all water continued to infiltrate on Kershaw soils. The data were fit to equations proposed by Horton, Green and Ampt, Phillip, Holtan, and Snyder. Adequate determinations of infiltration rates were obtained with each of the five equations tested, but the best representations of the infiltration-capacity curves were obtained from Horton's and Snyder's equations. Green and Ampt's, Phillip's, and Holton's equations consistently overestimated the early portion of the infiltration-capacity curve and underestimated the later portion. The wide variation in equation parameters between applications in situations in which similar initial conditions existed on the same soil was caused by experimental error rather than by the fit of the equations to the data. The results of fittings could be used as a guide for applying the equations in the Coastal Plain. (Roberts-ISWS)
W78-11449

THE EFFECT OF WASTE WATER REUSE IN COLD REGIONS ON LAND TREATMENT SYSTEMS,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 5D.
W78-11787

POLIOVIRUS REMOVAL FROM PRIMARY AND SECONDARY SEWAGE EFFLUENT BY SOIL FILTRATION,
Baylor Coll. of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
For primary bibliographic entry see Field 5D.
W78-11789

SUBSIDENCE OVER MINES AND CAVERNS, MOISTURE AND FROST ACTIONS, AND CLASSIFICATION.
For primary bibliographic entry see Field 4B.
W78-11865

MATHEMATICAL MODEL FOR PREDICTING MOISTURE MOVEMENT IN PAVEMENT SYSTEMS,
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
B. J. Dempsey, and A. Elzeftawy.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification; Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington, D.C., p 48-55, 1976. 9 fig, 32 ref.

Descriptors: *Moisture content, *Mathematical models, *Porous media, *Paving, Flow ates, Soil water movement, Model studies, Darcys law, Flow, Hydraulic conductivity, Theoretical analysis, Analytical techniques, Equations, Laboratory tests.

Reported herein was the development of a comprehensive moisture model for predicting moisture conditions in pavement systems, based on the Philip and de Vries equations for nonisothermal moisture movement and heat conduction. By using numerical methods, the implicit finite difference approximations to the moisture movement and heat-transfer equations were programmed for computer solution. Validation studies indicated that the moisture model could be used to predict accurately isothermal moisture conditions in pavement systems. The model also used to show the relative influence of nonisothermal conditions on pavement moisture content. The model was applicable to a wide range of boundary conditions and could be used with climatic input data to predict the moisture-temperature regime in pavement systems. (See also W78-11865) (Humphreys-ISWS).
W78-11872

UNSATURATED TRANSIENT AND STEADY-STATE FLOW OF MOISTURE IN SUBGRADE SOIL,
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
A. Elzeftawy, and B. J. Dempsey.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification; Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington D.C., p 56-61, 1976. 7 fig, 25 ref.

Descriptors: *Moisture content, *Soil water, *Unsaturated flow, *Laboratory tests, Mathematical models, Analysis, Hydraulic conductivity, Diffusivity, Measurement, Instrumentation, Data collections, Steady flow, Subgrade soil.

A general procedure for determining the soil-water properties necessary for predicting moisture movement in subgrade soils was described. A gamma-ray transmission method was used for the nondestructive measurement of the water content and a tensiometer-pressure transducer arrangement of measure the soil-water pressure (suction); the unsaturated hydraulic conductivity, diffusivity, and soil-water characteristics functions were evaluated of AASHO A-4 subgrade soil. The soil was compacted in a column at uniform density and moisture content and tested under isothermal conditions. A water table was established at the bottom of the soil column, and the transport of water through the subgrade soil was studied. The mathematical procedures for determining the soil-water properties from the laboratory data were described, and the use of the experimentally determined hyraulic conductivity, soilwater diffusivity, and soil-water characteristics functions in the prediction of moisture changes in an AASHO A-4 soil was demonstrated. The experimentally evaluated soil-moisture parameters are necessary for the prediction of moisture content and its movement in subgrade soil. (See also W78-11865) (Humphreys-ISWS)
W78-11873

PORE STRUCTURE OF SELECTED HAWAIIAN SOILS,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State. Univ., Ames. Engineering Research Inst.
R. A. Lohnes, E. R. Tuncer, and T. Demirel.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions; and Classification; Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington, D.C. p 76-79, 1976. 4 fig, 2 tab, 28 ref.

Descriptors: *Soils, *Soil physical properties, *Hawaii, *Pores, Laboratory tests, Porous media, Porosity, Soil types, Sands, Silts, Clays, Plasticity index, Liquid limits, Specific gravity, Size, Distribution, Testing procedures.

Many studies have emaphasized that the structure of fabric of deeply weathered tropical soils has important influences on their engineering behavior. This study attempted to characterize the structure of five soils from the island of Oahu, Hawaii, by mercury injection porosimetry. All the soils were derived from basalt, but each had weathered under a different mean annual rainfall. A comparison of air-dried, oven-dried, and freeze-dried samples showed that the method of during has little effect on the pore size distribution. The results of the comparison were interpreted as evidence that the structure of these soils is more stable than that of soils in which the main bonding material is clay. From 89 to 72% of the voids in these soils fall within a size range greater than 0.004 micrometer. Although the void ratio variations between these soils do not show any systematic trends, the pore size distributions do. The soils that had developed under wetter climates have higher pecentages of pores smaller than 2 micrometer in diameter and a more uniform pore size distribution. The pore size distributions can be related to the mineral and chemical contents of the soils in that soils weathered in wetter environments are higher in sesquioxide content and lower in kaolinite content. (See also W78-11865)(Humphreys-ISWS)
W78-11876

THE DEPENDENT DOMAIN THEORY APPLIED TO SCANNING CURVES OF ANY ORDER IN HYSTERETIC SOIL WATER RELATIONSHIPS,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.

A. Poulovassilis, and W. M. El-Ghamry.
Soil Science, Vol. 126, No. 1, p 1-8, July 1978. 9 fig, 13 ref.

Descriptors: *Soil water, *Hysteresis, *Model studies, Mathematical models, Wetting, Drying, Moisture content, Pressure, Pore pressure, Soils, Theoretical analysis, Soil science, Dependent domain theory.

The dependent domain theory was extended to cover scanning curves of any order in the hystertic relationship between soil water content, theta, and presure, P. It was argued that if the distribution function, F, for thedomains depends on the most recent reversal value of P, than F depends also on all the previous reversal values. Experimental primary scaning curves and scanning curves of the first, second, and third orders of the relationship between theta and P for a sand were presented, and the hysteretic behavior of this experimental relationship was compared with that predicted by the dependent domain theory. (Sims-ISWS)
W78-11879

A SIMPLE METHOD TO STUDY PESTICIDE SORPTION IN SOILS AT SHORT TIME INTERVALS,
Central Rice Research Inst., Cuttack (India). Lab. of Soil Microbiology.
For primary bibliographic entry see Field 5B.
W78-11880

HYDRAULIC CONDUCTIVITY OF ROCKFILL,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-11896

MICRO-RELIEF SURFACE DEPRESSION STORAGE: CHANGES DURING RAINFALL EVENTS AND THEIR APPLICATION TO RAINFALL-RUNOFF MODELS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W78-11934

HYDROLOGY OF THE NEVIN WETLAND NEAR MADISON, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-11972

LINEAR AND NONLINEAR MODELS OF INFILTRATION FROM A POINT SOURCE,
Arizona Water Resources Research Center, Tucson.
J. Ben-Asher, D. O. Lomen, and A. W. Warrick.
Soil Science Society of America Journal, Vol 42, No 1, p 3-6, January-February 1978. 6 fig, 11 ref. OWRT B-045-ARIZ(7).

Descriptors: *Infiltration, *Irrigation, *Soil water movement, *Model studies, Mathematical models, Analytical techniques, Equations, Soils, Soil water, Soil types, Diffusion, Hydraulic conductivity, Moisture content, Wetting, Drying, Soil science, Trickle irrigation, Matric flux potential.

Numerical and analytical solutions for water flow from a point source were compared. The numerical solution was for the nonlinear moisture flow equation, and the analytical solution was for the corresponding linearized form. For cyclic conditions, results were approximately the same with regard to range in values between the wettest and driest values. However, the numerical results showed a faster response both for wetting and drying. Computational times required of the analytical solution were of the order of 1/20 to 1/200th of that required for the finite difference solutions. (Sims-ISWS)
W78-12012

EFFECTS OF SOIL MOISTURE ON THE DIFFUSION COEFFICIENTS AND ACTIVATION ENERGIES OF TRITIATED WATER, CHLORIDE, AND METRIBUZIN,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
H. D. Scott, and R. F. Paetzold.
Soil Science Society of America Journal, Vol 42, No 1, p 23-27, January-February 1978. 3 fig, 2 tab, 25 ref. OWRT A-021-ARK(2).

Descriptors: *Diffusion, *Soil moisture, *Solutes, Laboratory tests, Moisture content, Soils, Soil horizons, Adsorption, Radioisotopes, Tritium, Chlorides, Herbicides, Soil temperature, Soil water, Soil water movement, Soil science, Metribuzin, Tortuosity.

Diffusion coefficients of tritiated water, chloride, and metribuzin were determined in Captina silt loam as functions of soil water content and soil temperature. Tritiated water and metribuzin were found to diffuse in both liquid and vapor phases, whereas chloride diffusion was restricted to the solution phase. For a given soil water content, values of the diffusion coefficients were larger in soil samples from the Ap horizon than in those from the B2t horizon for tritiated water and chloride. This was attributed to the greater tortuosity in the B2t horizon. Metribuzin had similar diffusion coefficients in both horizons, apparently reflecting offsetting effects due to the greater adsorption by the Ap and greater tortuosity in the B2t. Thermodynamic studies indicated that the energy requirement for diffusion of these solutes was inversely related to soil moisture content for tritiated water and metribuzin. Activation energies for chloride diffusion were lower than for other solutes at equal soil water contents. (Sims-ISWS)
W78-12013

PROGRAM AND ABSTRACTS: SYMPOSIUM ON NONBIOLOGICAL TRANSPORT AND TRANSFORMATION OF POLLUTANTS ON LAND AND IN WATER.
National Bureau of Standards, Washington, DC.
For primary bibliographic entry see Field 5B.
W78-12015

VERTICAL MOVEMENT AND DISTRIBUTION OF ORGANICS IN SOILS,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W78-12018

CHEMICAL DEGRADATION OF ORGANIC POLLUTANTS IN SOIL,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 5B.
W78-12021

PHOTOLYSIS OF PESTICIDES ON SOIL SURFACES,
Georgia Univ., Savannah. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-12023

OXIDATION AND REDUCTION OF PESTICIDES IN SOILS AND SEDIMENTS,
Department of Agriculture Beltsville, MD.
For primary bibliographic entry see Field 5C.
W78-12032

ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-12090

2H. Lakes

CHARACTERIZATION OF NUTRIENTS AND ALGAL BLOOMS AT ABIQUIU AND COCHITI RESERVOIRS,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11367

MODELING PHOSPHORUS CYCLING IN LAKE SEBASTICOOK NEWPORT, MAINE,
Maine Univ. at Orono. Dept. of Mathematics.
For primary bibliographic entry see Field 5C.
W78-11368

DETERMINATION OF THE SECONDARY PRODUCTION AND POPULATION DYNAMICS OF THE ZOOPLANKTON OF THE LAKE CHAMPLAIN ECOSYSTEM,
Vermont Univ., Burlington. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-11376

MIXING PROCESSES IN LAKES,
Technical Univ. of Denmark, Copenhagen (Denmark). Inst. of Hydrodynamics and Hydraulic Engineering.
N. E. Ottesen Hansen.
Nordic Hydrology, Vol 9, No 2, p 57-74, 1978. 11 fig, 1 tab, 24 ref.

Descriptors: *Lakes, *Mixing, *Turbulence, Diffusion, Model studies, Dispersion, Stratification, Entrainment, Winds, Water circulation, Model studies, Mathematical models, On-site investigations, Tracers, Foreign research, Limnology, *Sweden.

A review of the available methods for analyzing turbulent mixing in lakes was presented. The different types of flow were classified, and their turbulence characteristics were described. The diffusion caused by turbulence was examined with the conclusion that no reliable analytical description is available for the moment; so for technical purposes, field surveys were recommended. Entrainment processes in stratified lakes were analyzed by considering the turbulent energy exchange, and analytical expressions for common types of flow were presented. Finally, windrows, their origin and their effect on the mixing, were described. (Sims-ISWS)
W78-11424

WIND INDUCED CIRCULATION IN LAKES,
Lulea Univ. (Sweden). Div. of Water Resources Engineering.
L. Bengtsson.
Nordic Hydrology, Vol 9, No 2, p 75-94, 1978. 8 fig, 26 ref.

Descriptors: *Lakes, *Winds, *Water circulation, Model studies, Mathematical models, Mixing, Turbulence, Stratification, Currents(Water), Seiches, Water temperature, Thermocline, Foreign research, Limnology, *Sweden.

In most lakes the wind is the most important flow generating mechanism. In this paper, the problem of wind generated circulation - directly wind induced currents and seiches - in small lakes was reviewed. Many field observations were presented and discussed. In the thermocline and the hypolimnion, forced seiche currents were shown to dominate the directly induced wind currents. Different kinds of non-convective mathematical lake models were discussed and applied to different small lakes. Comparisons of observed and calculated current showed that lake models can be used to reproduce the currents of the upper 3-4 metres in a lake. The interaction between large-scale flow and turbulent flow is yet unknown; and therefore,

it is not possible to explain the physical current pattern and density anomalies at greater depth. In respect to the limited knowledge on turbulent processes in lakes, it is acceptable to apply a quadric relationship between wind stress and wind speed with a drag coefficient of about 0.001. (Sims-ISWS)
W78-11425

A ONE-DIMENSIONAL NUMERICAL MODEL FOR TEMPERATURE STUDIES IN LAKES,
Trondheim Univ. (Norway). Vassdrags- og Havnelaboratoriet.
A. Thendrup.
Nordic Hydrology, Vol 9, No 2, p 92-104, 1978. 9 fig, 10 ref.

Descriptors: *Lakes, *Water temperature, *Model studies, Mathematical models, Temperature, Winds, Mixing, Diffusion, Convection, Heat transfer, River flow, Inflow, Discharge(Water), Seasonal, Foreign research, Foreign countries, Limnology, *Norway.

Most hydroelectric schemes change the seasonal variation of river discharge. As a result, the temperature in lakes downstream of a hydroelectric plant will be changed. The numerical model described in this paper was developed to calculate the change in the vertical temperature distribution. The model was applied to two Norwegian lakes. (Sims-ISWS)
W78-11426

EXAMINATION OF THE SUMMER STRATIFICATION,
Lund Univ. (Sweden).
U. Svensson.
Nordic Hydrology, Vol 9, No 2, p 105-120, 1978. 6 fig, 15 ref, 1 append.

Descriptors: *Stratification, *Lakes, *Summer, *Model studies, Mathematical models, Temperature, Water temperature, Thermocline, Mixing, Thermal stratification, Heat, Foreign countries, Foreign research, Solar radiation, Lake morphometry, Limnology, *Sweden, *Lake Velen(Sweden).

The seasonal stratification in lakes was examined by a Qualitative evaluation of important physical processes and with the aid of a mathematical model. From the description of the physical processes, it was realized that the observed vertical temperature distribution is the synthesis of a number of complicated and inter-dependent phenomena. The mathematical model was employed for a quantitative estimate of the importance of lake morphometry and transparency. It was found that the vertical variation of horizontal area and variations in transparency strongly influence the thermal structure of a lake. Measurements of the temperature distribution in Lake Velen were compared to predictions obtained by the mathematical model. The agreement was found to be satisfactory, and it was concluded that the mathematical model provides a realistic way of studying and predicting the summer stratification. (Sims-ISWS)
W78-11427

ESTIMATING LAKE EVAPORATION WITH FLOATING EVAPORIMETERS AND WITH WATER BUDGET,
National Water Board of Finland, Helsinki. Hydrological Office.
For primary bibliographic entry see Field 2D.
W78-11428

EUTROPHICATION MODELS FOR LAKES,
Vandkvalitetsinstitut, Hoersholm (Denmark).
For primary bibliographic entry see Field 5C.
W78-11429

WINTER CURRENTS IN LAKE HURON,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
J. H. Saylor, and G. S. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 847, Price codes: A04 in paper copy, A01 in microfiche. NOAA Technical Memorandum ERL GLERL-15, EPA-905/4-75-004, December 1976. 117 p, 87 fig, 21 ref, 2 append.

Descriptors: *Currents(Water), *Winter, *Lake Huron, Current meters, Temperature, Circulation, Water temperature, Epilimnion, Winds, Gradients(Streams), Cycles, *Winter currents, Moorings, Grid, Lake-scale circulation, Cyclonic flow, Winter circulation, Geostrophic balance, Annual cycles.

Twenty-one current meter moorings were deployed in Lake Huron during winter 1974-75. The moorings were set in November 1974 and retrieved approximately 6 months later. The stations were configured on a coarse grid to measure the lake-scale circulation during winter. Water temperature also was recorded in nearly all of the 65 current meters deployed. Results revealed a strong cyclonic flow pattern in the Lake Huron Basin persisting throughout the winter. The observed winter circulation is very similar to what is now believed to be the summer circulation of epilimnion water, although the winter currents penetrate to deeper levels in the water column and are more intense. Winter cyclonic flow persists in a nearly homogeneous water mass, while summer currents exhibit an almost geostrophic balance with observed water density distributions. This suggests that the current field driven by prevailing wind streses across the lake's water surfce may have been largely responsible for establishing the horizontal gradients of water density observed in the lake during summer. The effects of ice cover were examined, and the distribution and movement of the ice cover with respect to lake current and temperature fields were discussed. (Roberts-ISWS)
W78-11445

LAKE ONTARIO ATLAS: INTERNAL WAVES,
New York Sea Grant Inst., Albany.
D. Landsberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 177, Price codes: A05 in paper copy, A01 in microfiche. Report NYSSGP-OA-77-011, 1977. 83 p, 32 fig, 4 tab, 50 ref.

Descriptors: *Internal waves, *Lake Ontario, *Thermocline, Temperature, Water temperature, Lakes, Winds, Stability, Coriolis force, Seiches, Mixing, Energy transfer, Limnology.

The long internal waves in the offshore zone of Lake Ontario consist of Poincare waves, one for each mode of motion, which stand across the lake and either stand or vary exponentially along it. The wavelengths of these waves are proportional to the basin width. The periods approach but never exceed the inertial period, and the lower mode oscillations travel faster and decay more slowly than the higher mode oscillations. The first and third modes are the most commonly observed in Lake Ontario, but the periods of all modes are so close together that they are difficult to separate and form an interference pattern. In the nearshore zone, the internal waves consist of 2 oppositely rotating internal Kelvin waves and quasi-geostrophic waves (formed from combinations of Poincare waves which satisfy the nearshore boundary conditions) of near inertial period and wavelength which depends on the internal Rossby radius of deformation. The sloping bottom in the nearshore zone causes the period of the internal Kelvin waves to be about 30 days, and the currents associated with these waves can be considered steady. However, when the internal rossby radius of deformation equals and then exceeds the effective shelf width, resonance occurs between the quasi-geostrophic-waves and the internal Kelvin waves, and the latter rotates with a perid of 12 to 16 days. This is believed to cause the observed cyclonic resultant transport in Lake Ontario in summer in the nearshore zone. (Sims-ISWS)
W78-11448

THE PHOSPHORUS STATUS OF EUTROPHIC LAKE SEDIMENTS AS RELATED TO CHANGES IN LIMNOLOGICAL CONDITIONS-PHOSPHORUS MINERAL COMPONENTS,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5C.
W78-11509

MERCURY AND CHLORINATED HYDROCARBONS IN PLANKTON OF LAKE PAIJANNE, FINLAND,
Jyvaskyla Univ. (Finland). Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-11526

EFFICACY OF COPPER SULPHATE IN THE SUPRESSION OF APHANIZOMENON FLOS-AQUE BLOOMS IN PRAIRIE LAKES,
Fisheries and Marine, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5G.
W78-11527

SURVEY OF THE SELENIUM CONTENT IN THE AQUATIC BIOTA OF WESTERN LAKE ERIE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W78-11529

PHYTOPLANKTON OF AN INSHORE AREA OF GEORGIAN BAY, LAKE HURON, PRIOR TO REDUCTIONS IN PHOSPHORUS LOADING,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
For primary bibliographic entry see Field 5C.
W78-11530

DECLINES IN THE NEAR-SHORE PHYTOPLANKTON OF LAKE ERIE'S WESTERN BASIN SINCE 1971,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
For primary bibliographic entry see Field 5C.
W78-11531

STUDIES OF THE LAKE WINGRA WATERSHED: AN INTERIM REPORT,
Wisconsin Univ.-Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-11532

THE LITTORAL AND PROFUNDAL BENTHIC NEMATODES OF LAKES WITH DIFFERENT TROPHY,
Warsaw Univ. (Poland). Zoological Inst. and Warsaw Univ. (Poland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W78-11533

NUTRIENTS AND PRODUCTIVITY AS INDICATORS OF THERMAL EFFLUENT UPWELLING INTERACTIONS IN LAKE MICHIGAN,
Argonne National Lab., IL.
For primary bibliographic entry see Field 5B.
W78-11537

THE EFFECTS OF SIMAZINE ON THE MOLLUSCAN FAUNA OF MORIANE LAKE, NEW YORK,
State Univ. of New York Coll. at Oneonta. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11539

NITROGEN TRANSFORMATIONS WITHIN THE TROPHOGENIC ZONE OF LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W78-11545

SIX POLLUTED LAKES: A PRELIMINARY EVALUATION OF THE TREATMENT AND RECOVERY PROCESSES,
Uppsala Univ. (Sweden). Algal Assay Lab.
For primary bibliographic entry see Field 5G.
W78-11549

ESTIMATION OF TOXICITY USING CULTURED MAMMALIAN CELLS OF THE ORGANIC POLLUTANTS RECOVERED FROM LAKE BIWA,
Kyoto Inst. of Public Health (Japan).
For primary bibliographic entry see Field 5C.
W78-11566

HYDROLOGIC INVENTORY AND EVALUATION OF NEVADA PLAYAS,
Nevada System Univ., Reno. Desert Research Inst.
R. L. Bateman, and J. W. Hess.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 327, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Center, Project Report No. 49, January 1978. 52p, append. OWRT A-070-NEV(1).

Descriptors: *Playas, Hydrologic data, Hydrologic data(Playas), Groundwater discharge(Playas), Water quality, Conductivity, Surveys, *Nevada(Playas).

One hundred and fifteen major playas greater than 0.25 sq/mi in area have been indentified and catalogued in Nevada. They are located throughout the state in areas of internal drainage. The average playa size is 18 sq./mi, with the largest being approximately 450 sq. mi in area. Sixty-eight (59%) of the playas actively discharge groundwater; many are terminal discharge sites. Forty-seven of Nevada's playas (41%) do not discharge groundwater to any measurable extent. Depth to groundwater may be in excess of 1000 ft under some of these dry playas. Groundwater quality, as measured by specific electrical conductivity, ranges from approximately 1000 umhos/cm associated with some non-discharging playas to greater than 100,000 umhos/cm in several discharging playas. Playa surfaces range from dry, hard and smooth through salt or evaporite crusts to very porous, puffy and sticky. Nevada playas have many potential uses including recreation, mineral recovery and liquid and solid waste disposal.
W78-11573

AN EVALUATION OF THE EFFECT OF DRAWDOWN ON THE TROPHIC STATUS OF A SMALL RESERVOIR,
Georgia Coll., Milledgeville. Center for Environmental Study and Planning.
For primary bibliographic entry see Field 5G.
W78-11576

SEASONAL PERIODICITY OF DIATOMS, AND SILICON LIMITATION IN OFFSHORE LAKE MICHIGAN, 1975,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W78-11587

DISSOLUTION OF DIATOM FRUSTULES AND RECYCLING OF AMORPHOUS SILICON IN LAKE MICHIGAN,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W78-11588

THE SPECIES DIVERSITY, NUMBERS AND BIOMASS OF BENTHIC NEMATODES IN CENTRAL PART OF LAKES WITH DIFFERENT TROPHY,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W78-11589

THE NEMATODES OF THE ROOT REGION OF AQUATIC MACROPHYTES, WITH SPECIAL CONSIDERATION OF NEMATODE GROUPINGS PENETRATING THE TISSUES OF ROOTS AND RHIZOMES,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W78-11590

THE LARGE-SCALE OPERATIONS MANAGEMENT TEST (LSOMT) WITH THE WHITE AMUR AT LAKE CONWAY, ORLANDO, FLORIDA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5G.
W78-11606

BASELINE DATA REPORT--LAKE CONWAY GRASS CARP PROJECT,
Florida State Game and Fresh Water Fish Commission, Orlando.
For primary bibliographic entry see Field 5G.
W78-11607

AQUATIC MACROPHYTE SAMPLING IN LAKE CONWAY,
Florida Dept. of Natural Resources, Orlando. Bureau of Aquatic Plant Research and Control.
For primary bibliographic entry see Field 5G.
W78-11608

BIOLOGICAL BASELINE STUDIES OF THE LAKE CONWAY, FLORIDA, SYSTEM,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5G.
W78-11609

BACKGROUND WATER-QUALITY ANALYSIS OF LAKE CONWAY,
Orange County Pollution Control Dept. Orlando, FL.
For primary bibliographic entry see Field 5G.
W78-11610

PROPOSED RELATIONSHIPS BETWEEN WHITE AMUR AND THE AQUATIC ECOSYSTEM AT LAKE CONWAY, FLORIDA,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 5G.
W78-11611

CULTURE TECHNIQUES FOR THE PRODUCTION OF MONOSEX WHITE AMUR,
Fish Farming Experimental Station, Stuttgart, AR.
For primary bibliographic entry see Field 5G.
W78-11612

TOTAL PHOSPHORUS MODEL FOR THE GREAT LAKES, (DISCUSSION),
Cleveland State Univ., OH.
For primary bibliographic entry see Field 5C.
W78-11623

WISCONSIN TRIBUTARY LOADINGS TO THE UPPER GREAT LAKES,
Wisconsin Dept. of Natural Resources, Madison. Div. of Environmental Protection.
For primary bibliographic entry see Field 5B.
W78-11628

FECUNDITY OF BLUEGILL AND WARMOUTH FROM A SOUTH CAROLINA BLACKWATER LAKE,
Carolinas Virginia Nuclear Power Associates, Inc., new Hill, NC. Energy and Environmental Center.
For primary bibliographic entry see Field 5C.
W78-11649

ENVIRONMENTAL CARCINOGENESIS STUDIES IN FISHES OF THE GREAT LAKES OF NORTH AMERICA,
Guelph Univ. (Ontario). Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-11724

FISH, WILDLIFE, AND RECREATIONAL VALUES OF MICHIGAN'S COASTAL WETLANDS,
Eastern Michigan Univ., Ypsilanti. Dept. of Geography and Geology.
E. Jaworski, and C. N. Raphael.
Michigan Department of Natural Resources, February 1978, 209 p. 25 fig, 62 tab, 205 ref, 1 append. Wetlands Value Study, Phase 1.

Descriptors: *Wetlands, *Michigan, *Value, Coastal marshes, Freshwater marshes, *Recreation, Sport fishing, Commercial fishing, Wildlife, Waterfowl, Furbearers, Ducks, Evaluation, Return(Monetary), Waste treatment.

Michigan has 105,855 acres of coastal wetlands which represent 3.5% of the state's total wetland acreage. In terms of average economic value for fish, wildlife, and recreation, Michigan's coastal wetlands cntribute an estimated $489.69 per wetland acre/year, for a total of $51.8 million/yr. Specifically, these economic values, in decreasing order of value, are: sport fishing ($286), nonconsumptive recreation ($138.24), waterfowl hunting ($31.23), trapping of furbearers ($30.44), and commercial fishing ($3.78) per wetland acre/yr. Inclusion of other values, e.g., waste assimilation and filtering of suspended solids, as well as ecological values could increase the average annual economic return to over $3000/acre. Historical data reveal that Michigan, since the mid-1800's has lost approximately 70% of its original coastal wetlands; available data suggest that at least 20% of the existing coastal wetlands; available data suggest that at least 20% of the existing coastal wetlands may be developed by private interests within the next decade. Wetlands in Saginaw Bay, Lake St. Clair, Lower Detroit River, and along the western shore of Lake Erie appear to be more significant economically, support the heaviest recreational use, and are, in selected areas, subject to the most intensive developmental pressures. (Stihler-Mass)
W78-11752

THE TURBULENT TRANSPORT AND BIOLOGICAL STRUCTURE OF EUTROPHICATION MODELS. VOLUME I, PRESERVING THE STATISTICAL STRUCTURE IN LAKE TRANSPORT CALCULATIONS,
Ohio State Univ., Columbus, Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-11863

THE TURBULENT TRANSPORT AND BIOLOGICAL STRUCTURE OF EUTROPHICATION MODELS. VOLUME II, COMPARATIVE STUDY OF THE MATHEMATICAL FORMULATIONS FOR PRIMARY PRODUCTIVITY IN STRATIFIED LAKES,
Ohio State Univ., Columbus, Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-11864

ALGAL NUTRIENT AVAILABILITY AND LIMITATION IN LAKE ONTARIO DURING IFYGL, PART II, NITROGEN AVAILABLE IN LAKE ONTARIO TRIBUTARY WATER SAMPLES AND URBAN RUNOFF FROM MADISON, WISCONSIN,
Texas Univ. at Dallas.
For primary bibliographic entry see Field 5C.
W78-11992

ALGAL NUTRIENT AVAILABILITY AND LIMITATION IN LAKE ONTARIO DURING IFYGL, PART III, ALGAL NUTRIENT LIMITATION IN LAKE ONTARIO DURING IFYGL,
Wisconsin Univ.-Madison.
For primary bibliographic entry see Field 5C.
W78-11993

SURVEY OF CHEMICAL FACTORS IN SAGINAW BAY (LAKE HURON),
Cranbrook Inst. of Science, Bloomfield Hills, MI.
For primary bibliographic entry see Field 5C.
W78-11994

DISTRIBUTION OF PHYTOPLANKTON IN SOUTH CAROLINA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-11995

DISTRIBUTION OF PHYTOPLANKTON IN MISSISSIPPI LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-11996

ASSESSMENT OF THE EFFECTS OF NUTRIENT LOADINGS ON LAKE ONTARIO USING A MATHEMATICAL MODEL OF THE PHYTOPLANKTON.
Hydroscience, Inc., Westwood, NJ.
For primary bibliographic entry see Field 5C.
W78-11998

TROPHIC EQUILIBRIUM OF LAKE WASHINGTON,
Washington Univ., Seattle. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-12001

DISTRIBUTION OF PHYTOPLANKTON IN WEST VIRGINIA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-12002

THE TROPHIC STATUS AND PHOSPHORUS LOADINGS OF LAKE CHAMPLAIN,
Vermont Univ., Burlington.
For primary bibliographic entry see Field 5C.
W78-12003

STANDING CROP OF BENTHIC INVERTEBRATES OF LAKE WINGRA AND LAKE MENDOTA, WISCONSIN,
Wisconsin Univ.-Madison.
For primary bibliographic entry see Field 5C.
W78-12004

CHANGES IN SUBMERGED MACROPHYTES IN GREEN LAKE, WISCONSIN FROM 1921 TO 1971,
For primary bibliographic entry see Field 5C.
W78-12006

PHOTOSYNTHESIS OF THE SUBMERGENT MACROPHYTE CERATOPHYLLUM DEMERSUM IN LAKE WINGRA,
Istituto Italiano di Idrobiologia, Pallanza (Italy).
For primary bibliographic entry see Field 5C.
W78-12007

AQUATIC HABITAT OF COAL AND BENTONITE CLAY STRIP MINE PONDS IN THE NORTHERN GREAT PLAINS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
C. L. Hawkes.
Presented at Proc. Intrn'l Congr. Energy and the Ecosystem, 1978. 5 p, 3 fig, 2 tab, 4 ref.

Descriptors: *Ponds, *Impoundments, *Water quality, *Aquatic habitats, *Rooted aquatic plants, *Lake morphology, *Clay, *Coal, *Strip mines, Great plains, North Dakota, South Dakota, Wyoming, Water fowl, Zooplankton, Bentonite, *Strip mine impoundments, *Livestock water impoundments, Semiarid lands, Wetland vegetation.

That ponds in the Northern Great Plains can be valuable aquatic habitats is illustrated by production of 2 million ducks annually upon approximately 220 thousand livestock ponds that were in the region in 1964. Strip mining for coal, bentonite clay and other minerals in the Northern Great Plains provides the opportunity for, or perhaps in some cases, the inevitability of water retaining impoundments. Where coal seams up to 100 feet thick are removed impoundments providing high quality aquatic habitats may be a desirable option. As a basis for stip mine pond design and management criteria, 43 existing strip mine ponds are being surveyed for selected parameters including water chemistry, invertebrate populations, plant communities, waterfowl use and basin morphometry. The ponds being investigated are located in North and South Dakota and Wyoming and represent both coal and bentonite mine impoundments of widely varying age. These unique impoundments of the semiarid northern Great Plains exhibit qualities related to their geographic location, geology, climate and the nature of the mining treatment. (Forest Service)
W78-12038

2I. Water In Plants

INSTREAM FLOW AND THE REPRODUCTIVE EFFICIENCY OF SOCKEYE SALMON,
Washington Univ., Seattle. College of Fisheries.
For primary bibliographic entry see Field 8I.
W78-11361

PRESPAWNING MORTALITY AND THE REPRODUCTIVE EFFICIENCY OF CEDAR RIVER SOCKEYE SALMON (SUPPLEMENTAL REPORT),
Washington Univ., Seattle. College of Fisheries.
For primary bibliographic entry see Field 8I.
W78-11362

SEEDLING RESPONSE TO PHOTOPERIOD AND THERMOPERIOD BY SALTMEADOW CORDGRASS, SPARTINA PATENS, FROM OCRACOKE ISLAND, NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Botany; and North Carolina State Univ. at Raleigh. Dept. of Soil Science.
E. D. Seneca.
Chesapeake Science, Vol 15, No 4, p 230-246, December, 1974. 2 fig, 6 ref.

Descriptors: *Photoperiodism, *Thermoperiodism, Biomass, *North Carolina, *Seedling response, *Saltmeadow cordgrass, *Ocracoke Island(NC), Coasts.

The study deals with the response of Saltmeadow Cordgrass, a dominant perennial grass in the high, irregularly-flooded salt marshes along the Atlantic and Gulf coasts, to various photoperiod-thermoperiod treatments. Seedlings of Saltmeadow Cordgrass were exposed to thermoperiods of 18-14, 22-18, 26-22, and 30-26C under both short- and long-day conditions for a 12 week experimental period. Seedlings in the long-day photoperiod produced significantly more biomass than those under the short-day photoperiod in the 22-18, 26-22, and 30-26C thermoperiods. Seedling biomass increased from the 22-18 to the 26-22 to the 30-26C thermoperiod under long-day conditions. Under short-day conditions, only the thermoperiod increase from 26-22 to 30-26C resulted in a significant increase in seedling biomass. Seedlings grown under long-day conditions were taller and produced more culms and rhizomes than those under short-day conditions at the same temperatures. Flowering occurred only under long-day conditions in the 22-18, 26-22, and 30-26C thermoperiods and only on seedlings left under experimental conditions for an extended period of time. (Maroncelli-Mass)
W78-11750

SALT MARSH VEGETATION: LATITUDINAL GRADIENTS IN THE ZONATION PATTERNS,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
E. C. Pielou, and R. D. Routledge.
Oecologia, Vol 24, No 4, p 311-321, 1976. 3 fig, 2 tab, 12 ref, 1 append.

Descriptors: *Salt marshes, *Vegetation, *Latitudinal studies, *Ecological distribution, Competition, Coastal marshes, *Canada, Rooted aquatic plants, Wetlands, Zonation, Polymorphism.

Zonation patterns of salt marsh vegetation were examined at latitudes ranging from 44 degrees 40 minutes north at Halifax, Nova Scotia to 58 degrees 50 minutes north at Churchill, Manitoba. In all areas examined the landward boundaries of the species' zones were more nearly coincident (i.e., more clustered) than their seaward boundaries. A conspicuous latitudinal trend was found: the clustering of both landward and seaward boundaries increased with increasing latitude. Evidence that between-species competition influences the locations of zone boundaries was also obtained. Increasing widths of the zones of salt marsh plants with increasing latitude may be due to the less stable climates at high latitudes resulting in local populations of plant which tend to have a high genetic variability. (Stihler-Mass)
W78-11751

FISH, WILDLIFE, AND RECREATIONAL VALUES OF MICHIGAN'S COASTAL WETLANDS,
Eastern Michigan Univ., Ypsilanti. Dept. of Geography and Geology.
For primary bibliographic entry see Field 2H.
W78-11752

SEASONAL CHANGES IN THE PRODUCTIVITY, CALORIC CONTENT, AND CHEMICAL COMPOSITION OF A POPULATION OF SALT-

MARSH CORD-GRASS (SPARTINA ALTERNIFLORA),
Rutgers - The State Univ., Camden, NJ. Dept. of Biology.
E. R. Squiers, and R. E. Good.
Chesapeake Science, Vol 15, No 2, p 63-71, June, 1974. 5 fig, 3 tab, 38 ref.

Descriptors: *Seasonal, *Productivity, *Standing crops, Population, Biomass, Vegetation, Salt marshes, Caloric content, Chemical composition, Salt-marsh Cord-grass, Growing season, *New Jersey, *Great Bay(NJ).

During the 1972 growing season, the productivity of a short form and a tall form of salt-marsh cordgrass was studied by the harvest method in the vicinity of the Rutgers Marine Sciences Center on Great Bay near Tuckerton, New Jersey. The aboveground biomass of living and dead grass was determined and subsamples were analyzed for caloric equivalents, ash, nitrogen, crude protein, crude fiber, ether extract, and nitrogen free extract. Salt-marsh cord-grass had peak standing crops of 1,592 g/sq.m. for tall form and 592 g/sq.m. for short form. Standing crops of crude fiber, ether extract, nitrogen free extract, and caloric values are a function of dry matter production while nitrogen components seem to be influenced by some other factor. Seventy percent of the crude protein was present in early summer at a time when dry weight was less than 50% of its maximum value. The data indicate that the amount of nitrogen that the plant accumulates in its aboveground parts early in the growing season is directly related to the peak of dry matter standing crop. The early spring accumulation of nitrogen may act to offset shortages at the peak of the growing season. The chemical composition of litter and soil samples suggests that biological breakdown of plant material occurs at the soil surface. (Maroncelli-Mass)
W78-11755

EFFECTS OF GRAZING ON A SALT MARSH,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 4C.
W78-11758

THE CONSERVATION OF WETLAND HABITATS FOR WATER FOWL IN SOUTHERN AFRICA,
Wildlife Society of Southern Africa, Pinetown; and Transvaal Provincial Administration, Pretoria (South Africa). Div. of Nature Conservation.
For primary bibliographic entry see Field 6G.
W78-11759

EFFECT OF OVERSTORY REMOVAL ON PRODUCTION OF SHRUBS AND SEDGE IN A NORTHERN MINNESOTA BOG,
Forest Service (USDA), Grand Rapids, MN. North Central Forest Experiment Station.
For primary bibliographic entry see Field 4C.
W78-11760

THE SIGNIFICANCE OF THE SURFACE FILM IN SALT MARSH PLANKTON METABOLISM,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 2L.
W78-11761

PROPAGATION OF SMOOTH CORDGRASS, SPARTINA ALTERNIFLORA, FROM SEED IN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
S. W. Broome, W. W. Woodhouse, Jr., and E. D. Seneca.
Chesapeake Science, Vol 15, No 4, p 214-221, December, 1974. 6 fig, 2 tab, 14 ref.

Descriptors: *Seeds, *Marsh plants, *Marshes, *Germination, Vegetation establishment, Marsh management, Intertidal areas, Salt marshes, Wetlands, Dredging, Spoil banks, North Carolina, *Propagation, *Spartina alterniflora.

Spartina alterniflora, the dominant vascular plant of the intertidal zone of bays and estuaries along most of the east coast of North America, produces large quantities of viable seed, particularly when stands are vigorous and relatively young. Excellent germination occurred when seeds were harvested as near maturity as possible, stored in burlap sheets at 2-3C for 1 month, and submerged in estuarine or sea water at 2-3C until seeding the following spring. Direct seeding from April until early June is an effective method of establishing new stands of S. alterniflora on dredge spoils in protected areas. The elevational range over which seedlings can be expected to survive is limited to the upper 20-50% of that occupied by natural stands in a given area. Seedling survival range is affected by the exposure of a site to normal wave action and the occurrence of storms; exclusion of light and air due to longer inundation at lower elevations is also a factor. Complete cover is achieved the first growing season and the aboveground standing crop produced from seed in one growing season can exceed that produced from transplants and may approach that of long established marshes. (Maroncelli-Mass)
W78-11764

THE GROWTH OF SPHAGNUM: SOME EFFECTS OF ENVIRONMENT,
Westfield Coll., London.
R. S. Clymo.
Journal of Ecology, Vol 61, No 3, p 849-869, November, 1973. 8 fig, 7 tab, 18 ref.

Descriptors: *Sphagnum species, *Moses, *Environmental effects, *Plant growth, Microenvironment, Hydrogen ion concentration, Calcium, Inorganic compounds, Ions, Distribution, Water table, Evaporation, Drying, Resistance.

Two problems are dealt with: the distribution of Spaghum on a large scale in relation to H+ and Ca2+ concentration and supply; smaller scale distribution of different species of Sphagnum in microhabitats of pool, lawn and hummock. The growth of up to twelve species of Sphagnum was measured in experiments with factorial combinations of pH (3.5-7.5) with Ca2+ (0.05-5.0 m-equiv./l), and of water table (surface to -10 cm) with shading (none to 0.82). Most plants grew well at low pH and Ca2, and nearly as well at high pH or high Ca 2+, but high pH with high Ca 2+ was lethal to most species. S. squarrosum was notably more tolerant than the other species tested. Growth in weight and in length were highly correlated in most of these treatments, except when water supply and shade were the variables. In unshaded conditions growth in weight was greater at lower water-table levels, but water table had little effect if the plants were shaded. By contrast, growth in length was less in low water-table conditions, particularly if the plants were shaded too. The pattern of response of different species to water table and shade was not clearly correlated with field distribution. There was a positive correlation between growth and supply of inorganic ions (varied concentration and flow rate). Dessication tolerance, in an artificial test, showed no correlation with field behavior, but evaporation rate (used as a measure of supply) and ability to maintain a high capitulum water content did. The surface irregularity of a Sphagnum carpet decreases as the water table falls, and a mechanism to explain this is proposed. (Maroncelli-Mass)
W78-11765

LEAF RESISTANCE AND XYLEM POTENTIAL DIFFER AMONG BROADLEAVED SPECIES,
Northeastern Forest Experiment Station, Durham, NH.
C. A. Federer.
Forest Science Vol. 23, No. 4, December 1977, p 411-419.

Descriptors: *Stomata, *Moisture stress, *Soil-water-plant relationships, Transpiration, Deciduous trees, Shrubs, Plant water potential.

Mean leaf diffusive resistance in unstressed trees and shrubs of 27 species in New Hampshire and southern Maine ranged only from 2.5 to 4.5 s/cm after normalizing to 15 mbar vapor pressure deficit. One species Spiraea latifolia, had a higher resistance, 5.8 s/cm. During water stress, stomata partially closed at xylem pressure potentials that differed among genera, averaging -15 bar for Betula, -17 for Populus, -21 for Quercus, and -23 for Prunus. The potentials did not decrease further as resistances increased. Stressed Quercus and Prunus seedlings had lower potentials than did larger trees. (Forest Service)
W78-12070

2J. Erosion and Sedimentation

PREPARATION AND ANALYSIS OF WATER SEDIMENT AND PLANT SAMPLES FOR METALS,
South Dakota State Univ., Brookings. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-11372

STREAM BOTTOM SEDIMENTATION IN ILLINOIS RIVERS: PRELIMINARY EVALUATION ON USGS GAGING STATION DATA,
Northern Illinois Univ., DeKalb. Dept. of Geology.
J. B. Leedy, and R. C. Flemal.
Illinois Water Information System Group Report of Investigations No. 10, June 1978. 12 p, 5 fig, 2 tab, 4 ref.

Descriptors: *Sedimentation, *Erosion, *Stream gages, *Illinois, Data processing, Sediments, Bottom sediments, Streamflow, Rivers, Streams, Geomorphology, Channels, Channel flow, Channel morphology, Discharge(Water), Degradation(Stream), Aggradation.

Among the many alleged problems of sediment pollution is that deposition of sediment on stream bottoms both destroys bottom habitat and inhibits the functining of bottom-dwelling organisms due to excessive burial, clogging of feeding organs, etc. While it is well documented that such adverse effects can occur, it remains to be fully documented that effects of this type are common, that they are the result of man-induced phenomena rather than natural processes. As part of this general question, data were explored that might give some clues as to the (1) natural conditions of Illinois streams before the advent of widespread agriculturally-induced land disturbance, (2) changes in stream conditions which have occurred in post-settlement times, and (3) current and possible future status of stream channel erosion and sedimentation. Part of this general investigation has lead us to explore the record of U.S. Geological Survey stream gaging meaurements. These consists of recordings of gage height, channel cross-sectional area, and channel width made each time a field discharge measurement was collected at a standard USGS gaging site. It is felt that if there are demonstrable changes in stream channel geometry in recent times, these ought to be expressed in the gaging measurements. (Sims-ISWS)
W78-11440

TURBULENCE EFFECTS ON SETTLING AND TRANSPORT OF SOLID PARTICLES IN SUSPENSION,
Pisa Univ. (Italy). Inst. of Hydraulics.
V. Milano.

Available from the National Technical Information Services, Springfield, VA 22161 as N76-19375, Price codes: A03 in paper copy, A01 in microfiche. NASA Technical Translation 16,907, Mar 76. 28 p, 4 fig, 46 ref. Trans. of 'Effetti della turbolenza sulla sedmentazione e sul transporto in sospensione di particelle solide', Inst. of Hydraulics, Univ. of Pisa, (Italy), Pub. No 1515, S 31, p 447-475.

Descriptors: *Turbulence, *Sediments, *Suspended solids, *Model studies, Mathematical models, Settling velocity, Sediment transport, Streamflow, Turbidity, Sedimentology.

The settling of suspended solid particles was discussed in terms of concentration at a point and the probability that a particle traverses the point at a given instant by use of equation of motion. Models for a particle in turbulent water were developed. (Sims-ISWS)
W78-11446

THE PHOSPHORUS STATUS OF EUTROPHIC LAKE SEDIMENTS AS RELATED TO CHANGES IN LIMNOLOGICAL CONDITIONS-PHOSPHORUS MINERAL COMPONENTS,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5C.
W78-11509

PROCEEDINGS OF THE FEDERAL INTER-AGENCY SEDIMENTATION CONFERENCE, 1963.
Agricultural Research Service, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 380, Price codes: A00 in paper copy, A01 in microfiche. Report SED/COM-02. Conference held January 28-February 1, 1963, Jackson, Mississippi, Miscellaneous Publication No. 970, Agricultural Research Service, Washington, D.C., June 1965. 938 p.

Descriptors: *Sedimentation, *Conferences, *Rivers, *Reservoirs, *Estuaries, Sediment control, Stream erosion, Erosion control, Scour, Coasts, Dredging, Harbors, Streams, Channels, Model studies, Hydraulic models, Data collections, Laboratory tests, On-site investigations, Surveys, Sampling, Sediments, Bank stabilization, Instrumentation, Equipment, Bed load, Reservoir silting, Watersheds(Basins), Alluvial channels, Sediment transport.

This publication contained the 91 papers and discussions of the second Federal inter-agency sedimentation conference. The meeting was a working conference in which representatives of Federal agencies and of universities could discuss sedimentation problems and methods being used for their investigation and solution. The broad topics covered included: land erosion and control; sediments in streams; sedimentation in estuaries, harbors, and coastal areas; sedimentation in reservoirs; laboratory investigation; and field investigations. (See also W77-00775) (Humphreys-ISWS)
W78-11898

LITTORAL ENVIRONMENT OBSERVATIONS AND BEACH CHANGES ALONG THE SOUTHEAST FLORIDA COAST,
Coastal Engineering Research Center, Fort Belvoir.
For primary bibliographic entry see Field 2L.
W78-11962

SURFICIAL SEDIMENTS AND SEAGRASSES OF EASTERN GREAT SOUTH BAY, N.Y.,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W78-11963

ENTRAPMENT OF SUSPENDED MATERIALS IN THE SAN FRANCISCO BAY-DELTA ESTUARY,
Bureau of Reclamation, Sacramento, CA. Water Quality Branch.
For primary bibliographic entry see Field 2L.
W78-11964

FLUVIAL SEDIMENT STUDY OF FISHTRAP AND DEWEY LAKES DRAINAGE BASINS, KENTUCKY - VIRGINIA,
Geological Survey, Louisville, KY. Water Resources Div.
For primary bibliographic entry see Field 4D.
W78-11991

HYDROLOGIC TRANSPORT PROCESSES FOR POLLUTANTS IN WATER AND ON SEDIMENTS,
Hydrocomp, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 5B.
W78-12016

PATTERNS OF DEPOSITION OF RADIONUCLIDES IN SEDIMENTS,
Argonne National Lab., IL.
For primary bibliographic entry see Field 5B.
W78-12019

AQUATIC HABITAT OF COAL AND BENTONITE CLAY STRIP MINE PONDS IN THE NORTHERN GREAT PLAINS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
For primary bibliographic entry see Field 2H.
W78-12038

2K. Chemical Processes

SELENIUM IN SOUTH DAKOTA GROUND AND SURFACE WATER,
Geological Survey, Vermillion, SD.
For primary bibliographic entry see Field 5A.
W78-11371

PREPARATION AND ANALYSIS OF WATER SEDIMENT AND PLANT SAMPLES FOR METALS,
South Dakota State Univ., Brookings. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-11372

HYDROSPHERIC TRACE ELEMENTS AND THEIR APPLICATION IN TRACING WATER POLLUTANTS,
Oregon State Univ., Corvallis. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-11375

A RAPID AUTOMATED SYSTEM FOR THE ANALYSIS OF DISSOLVED TOTAL ORGANIC NITROGEN IN AQUEOUS SOLUTIONS,
Michigan Univ., Ann Arbor. Environmental Chemistry Lab.
For primary bibliographic entry see Field 5A.
W78-11885

CHEMISTRY OF WATERS IN THE GEOPRESSURED ZONE FROM COASTAL LOUISIANA -- IMPLICATIONS FOR THE GEOTHERMAL DEVELOPMENT,
Geological Survey, Menlo Park, CA. Water Resources Div.
Y. K. Kharaka, P. M. Brown, and W. W. Carothers.
Geothermal Resources Council, TRANSACTIONS, Vol. 2, p 371-374, July 1978. 3 fig, 1 tab, 9 ref.

Descriptors: *Geothermal studies, *Thermal water, *Water quality, *Geochemistry, Water analysis, Chemical analysis, Oil fields, Dissolved solids, Trace elements, Louisiana, *Gulf Coast, Vermillion Parish, St. Mary Parish, Iberia Parish.

Detailed chemical analyses of 27 formation-water samples from 7 oil and gas fields in the Lafayette area, Louisiana, show that the salinity of water in the geopressured zone ranges from about 22,000 to 275,000 mg/liter dissolved solids. The large differences in the salinity of water in the geopressured zone from different fields result mainly from interaction of water with salt beds. The concentrations of H2S (<1 mg/liter), silica (<114 mg/liter), and a number of toxic trace metals are low in the geopressured geothermal waters. The relatively high salinity of these waters, however, and the moderately high concentrations of environmentally toxic components (boron, up to 69 mg/liter, and ammonia, up to 100 mg/liter, for example) are unfavorable to geothermal development. The chemical data indicate that careful evaluation of the compatibility of the spent geothermal waters and the waters in the formations used for injection will be required to minimize loss of porosity due to precipitation of carbonates and sulfates of Ca, Sr, and Ba. (Woodard-USGS)
W78-11980

WATER-QUALITY RECORDS FOR THE HUBBARD CREEK WATERSHED, TEXAS, OCTOBER 1974 - SEPTEMBER 1976,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-11981

AN ANALYSIS OF STREAM TEMPERATURES, GREEN RIVER BASIN, WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
H. W. Lowham.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 062, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-13, January 1978. 41 p, 14 fig, 5 tab, 11 ref.

Descriptors: *Water temperature, *Wyoming, *Streams, *Estimating, *Computer models, Analytical techniques, Regional analysis, Statistical methods, *Green River basin(Wyo).

A method for estimating temperatures of streams in the Green River basin, Wyoming, utilizes a regional model for estimating mean daily temperatures of streams at unmeasured sites. The regional model was developed by describing annual temperature patterns at 43 measured sites and by applying the harmonic function $T = M + A \cdot \sin(0.0172\ t + C)$- where: T is mean daily temperature; M, A, and C are harmonic coefficients calculated from data for each stream-temperature station; and t is the day of the water year. Application of the equation for estimating temperatures at unmeasured sites requires regionalized estimates of M, A, and C. Regional estimates were developed with the aid of multiple-regression techniques, whereby the calculated harmonic coefficients were regressed against physical and climatic characteristics of the stream-temperature stations. Stream elevation was a significant factor affecting water temperature. Analysis of areal and temporal variations in temperature showed that springs, irrigation return flows, and reservoir storage were affecting reaches of several major streams. (Woodard-USGS)
W78-11989

EFFECTS OF SOIL MOISTURE ON THE DIFFUSION COEFFICIENTS AND ACTIVATION ENERGIES OF TRITIATED WATER, CHLORIDE, AND METRIBUZIN,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.

W78-12013

ACIDITY OF RAIN AND SNOW: A POTENTIAL PROBLEM FOR NEW HAMPSHIRE,
Northeastern Forest Experiment Station, Durham, NH.
J. W. Hornbeck, and R. S. Pierce.
New Hampshire Forest Notes, Winter 1977-78(131): p. 6-7.

Descriptors: *Chemistry of precipitation, *Forests, *Acidity, Leaching, Hubbard Brood Experimental Forest, Precipitation acidity.

Studies at the Hubbard Brook Experimental Forest have characterized the chemistry of precipitation falling on New Hampshire, and have identified and defined some of the potential impacts. A major finding is that precipitation is acidic, largely as a result of human activities. The more obvious impacts, such as leaching of nutrients from foliage, have been determined, but many of the impacts are more subtle and will require further study. (Forest Service)
W78-12037

AQUATIC HABITAT OF COAL AND BENTONITE CLAY STRIP MINE PONDS IN THE NORTHERN GREAT PLAINS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
For primary bibliographic entry see Field 2H.
W78-12038

RECOVERY OF A DEFORESTED ECOSYSTEM,
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 4C.
W78-12071

2L. Estuaries

FRESHWATER INFLOW AND ITS EFFECT ON THE SALINITY AND BIOTA OF SHALLOW LAGOONS, (PARTS I AND II),
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
J. van de Kreeke, J. D. Wang, R. G. Rehrer, and M. A. Roessler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 111, Price codes: A06 in paper copy, A01 in microfiche. Publication No. TR77-4, September 1976. 100 p, 78 fig, 5 tab, 19 ref. OWRT C-4253(no. 9038)(1), 14-31-0001-9038.

Descriptors: *Biological communities, Fresh water, *Salinity, *Spatial distribution patterns, Estuaries, *Florida, Tides, *Dispersion, Circulation, Flood control, *Mathematical models, Statistical methods, *Lagoons(Shallow), *Model studies, *Salt transport.

Using field measurements an earlier developed (finite difference) hydrodynamics model was calibrated. The model is based on the one-dimensional long wave equations, including the advective terms. For the inlets separate algorithms are used based on the inlet equations. Friction factors in the lagoon rage between F = 0.002 and F = 0.017 as compared to a value of F = 0.0025 often cited in the literature. The numerical model yielded values of the tidally averaged discharge of 150 cfs and 50 cfs respectively without and with the baroclinic term. A typical value of the fresh water inflow is 500 cfs. In the far field the salt transport is governed by the tidally averaged discharge and the trapping effect. Closer to the source of fresh water inflow, gravitational circulation is important. A real time salt transport model based on the one-dimensional longitudinal dispersion equation was developed and calibrated. The dispersion coefficient was assumed constant. A value of 1100 ft(2)/sec best fits the data. The overall flushing time was estimated as one week. A statistical treatment of results of trawl and grab samples showed that maintaining salinities of 30 ppt (corresponding to a fresh water discharge of 100 cfs) or higher in the interior part of the lagoon would permit the further expansion into the lagoon of the rich species assemblage presently existing near north Lake Worth Inlet.
W78-11381

BIBLIOGRAPHY ON THE EFFECTS OF PRESCRIBED BURNING AND MAMMAL AND WATERFOWL UTILIZATION OF WETLANDS: ANNOTATED LITERATURE SEARCH WITH SELECTED ABSTRACTS,
Fish and Wildlife Service, Annapolis, MD. Div of Ecological Services.
For primary bibliographic entry see Field 10C.
W78-11385

POLYCHLORINATED BIPHENYL (PCB) DEGRADING BACTERIA AND PCB IN ESTUARINE AND MARINE ENVIRONMENTS,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-11430

SURFACE CIRCULATION AND REPLACEMENT OF WATER IN MONTEREY BAY,
San Jose State Univ. CA.; and Moss Landing Marine Labs., CA.
For primary bibliographic entry see Field 5B.
W78-11431

CALIBRATION OF SELECTED INFILTRATION EQUATIONS FOR THE GEORGIA COASTAL PLAIN,
Agricultural Research Service, Beltaville, MD. Plant Physiology Inst.
For primary bibliographic entry see Field 2G.
W78-11449

RECREATION--MARINE PROMISE.
University of Southern California, Los Angeles. Sea Grant Program.
For primary bibliographic entry see Field 6B.
W78-11451

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE. SPECIAL REPORT II: A NON-LINEAR PROGRAMMING MODEL FOR EVALUATING WATER SUPPLY POLICIES IN THE TEXAS COASTAL ZONE,
Texas Univ. at Austin. Div. of Natural Resources and Environment.
For primary bibliographic entry see Field 5G.
W78-11454

THE GROWTH OF ECONOMIC VALUES IN PRESERVATION: AN ESTUARINE CASE STUDY,
Oregon Univ., Eugene. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-11502

EFFECT OF NUTRIENT ENRICHMENT ON GROWTH OF THE EELGRASS ZOSTERA MARINA IN THE CHESAPEAKE BAY, VIRGINIA, USA,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5C.
W78-11512

RESPONSE TO POLYCHLORINATED BIPHENYLS OF MARINE PHYTOPLANKTON ISOLATES CULTURED UNDER NATURAL CONDITIONS,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5C.
W78-11528

LONG-TERM VARIATION OF ORGANOCHLORINE RESIDUES AND ASSEMBLAGES OF EPIBENTHIC ORGANISMS IN A SHALLOW NORTH FLORIDA (USA) ESTUARY,
Florida State Univ., Tallahassee. Dept. of Biological Science.
For primary bibliographic entry see Field 5C.
W78-11538

IONIZATION OF AMMONIA IN SEAWATER: EFFECTS OF TEMPERATURE, PH, AND SALINITY,
Sea Research Foundation, West Hartford, CT. Inst. for Aquarium Studies.
For primary bibliographic entry see Field 5C.
W78-11553

ASSIMILATION OF CO2 IN THE DARK COMPARED TO PHYTOPLANKTON PRODUCTION IN A SMALL COASTAL INLET,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Fisheries and Marine Service.
For primary bibliographic entry see Field 5C.
W78-11584

A SEASONAL STUDY OF THE DISTRIBUTIONS OF SURFACE STATE VARIABLES IN LIVERPOOL BAY. I. WINTER DATA,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5B.
W78-11585

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN, I. INTRODUCTION - THE STUDY AND THE STUDY AREA,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
For primary bibliographic entry see Field 5C.
W78-11624

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN III. NUMERICAL ABUNDANCE AND BIOMASS,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
For primary bibliographic entry see Field 5C.
W78-11625

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN V. ECOLOGY OF THE COPEPODA,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
For primary bibliographic entry see Field 5C.
W78-11626

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN VII. ECOLOGY OF THE AMPHIPODA,
Australian Museum, Sydney.
For primary bibliographic entry see Field 5C.
W78-11627

A THREE-YEAR STUDY AT WINSOR COVE: SALT MARSH GRASSES AND NO. 2 FUEL OIL,
Woods Hole Oceanographic Institution, MA. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11637

THE CHEDABUCTO BAY SPILL - ARROW, 1970,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 5B.
W78-11648

ORGANIC POLLUTION OF BOTTOM MUD IN THE SETO INLAND SEA AND ITS REMOVAL EXPERIMENT,
Nansei Regional Fisheries Research Lab., Hiroshima (Japan).
For primary bibliographic entry see Field 5G.
W78-11659

A SURVEY OF THE FISH POPULATIONS OF THE MIDDLE SEVERN ESTUARY BASED ON POWER STATION SAMPLING,
Bath Univ. (England). School of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-11662

DISTRIBUTION AND ABUNDANCE OF HYDROCARBON-UTILIZING BACTERIA IN SEDIMENTS OF CHEDABUCTO BAY, NOVA SCOTIA, IN 1976,
Fisheries and Marine Service, Halifax (Nova Scotia).
For primary bibliographic entry see Field 5B.
W78-11694

APPARENT EFFECTS OF FLOODING ON DISTRIBUTION AND LANDINGS OF INDUSTRIAL BOTTOMFISH IN THE NORTHERN GULF OF MEXICO,
National Marine Fisheries Service, Pascagoula, MS. National Marine Fisheries Center.
M. Russell.
Northeast Guld Science, Vol 1, No 2, p. 77-78, 1977. 2 fig, 1 tab, 11 ref.

Descriptors: *Floods, *Bottom fish, Floodwater, *Guld of Mexico, Commercial fish, Commercial fishing, Fish populations, Nutrient, Mississippi River, Flood routing, Flood control.

Evidence is presented that suggests river discharge affected bottom fish distribution from January through June 1972 and 1973. Also, normal commercial concentrations of industrial bottomfish were not seen on the inshore grounds from Mobile Bay, Ala. to Trinity Shoal, La. during peak flood periods in 1973. Comparison between river runoff and annual bottomfish landings for the last 17 years, however, indicates that flooding may be beneficial to annual production, by increasing availability of nutrients and extending the estuarine nursery boundaries. (EIS-Katz)
W78-11722

SEEDLING RESPONSE TO PHOTOPERIOD AND THERMOPERIOD BY SALTMEADOW CORDGRASS, SPARTINA PATENS, FROM OCRACOKE ISLAND, NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Botany; and North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2I.
W78-11750

SALT MARSH VEGETATION: LATITUDINAL GRADIENTS IN THE ZONATION PATTERNS,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-11751

EMIGRATION OF JUVENILE ATLANTIC CROAKERS, MICROPOGON UNDULATUS, FROM A SEMI-IMPOUNDED MARSH IN SOUTHWESTERN LOUISIANA,
Louisiana Cooperative Wildlife Research Unit, Baton Rouge.
P. M. Yakupzack, W. H. Herke, and W. G. Perry.
Transactions of the American Fisheries Society, Vol 106, No 6, p 538-544, November, 1977. 3 fig, 22 ref.

Descriptors: *Juvenile fish, *Marine fish, Movement, *Seasonal, Gulf of Mexico, Fish, Marshes, Estuaries, *Louisiana.

Descriptions of the emigration patterns of juvenile Atlantic croakers from their nurseries in estuarine waters have varied from (1) gradual seaward movements, to (2) mass outward movements, to (3) a 'bleeding off' of the larger individuals. Emigration patterns are reported for a semi-impounded marsh within a few kilometers of the Gulf of Mexico. Patterns were monitored by trawling within the nursery and continuous trapping in the nursery outlet. Early in the year (February and March) croakers were small and tended to move in and out of the nursery with the tide. Thereafter there was an increasing divergence in the size of trawl- and trap-caught croakers. The fish taken in the trap were consistently the larger, indicating that larger juveniles were continually 'bleeding off' and emigrating back to the Gulf. (Stihler-Mass)
W78-11753

SEASONAL CHANGES IN THE PRODUCTIVITY, CALORIC CONTENT, AND CHEMICAL COMPOSITION OF A POPULATION OF SALT-MARSH CORD-GRASS (SPARTINA ALTERNIFLORA),
Rutgers - The State Univ., Camden, NJ. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-11755

THE SIGNIFICANCE OF THE SURFACE FILM IN SALT MARSH PLANKTON METABOLISM,
Georgia Univ., Sapelo Island. Marine Inst.
J. L. Gallagher.
Limnology and Oceanography, Vol. 20, No. 1, p 120-123, January, 1975. 3 fig, 2 tab, 13 ref.

Descriptors: *Plankton, *Metabolism, *Surfaces, *Films, *Salt marshes, Water, Tides, Water level fluctuations, *Georgia, Pigments, Photosynthesis, Respiration, Coastal marshes, Marshes, Wetlands, Water column.

Comparisons were made between plankton communities associated with surface films and the remainder of the water column in a Georgia salt marsh. The fluorescence of acetone extracts indicated that a film several orders of magnitude richer in plant pigments than the underlying water developed as the tide rose over the marsh surface. As the tide ebbed, the concentration of pigment in the film dropped to levels similar to those in the water below. About 37% of plankton net photosynthesis was concentrated in the surface film. Respiration of the film averated 21% of the gross phogosynthesis while the ratios of photosynthesis to respiration ranged from 10.9 to 2.5. Data suggest that surface film is one of the centers of metabolic activity in a marshland system. (Maroncelli-Mass)
W78-11761

PROPAGATION OF SMOOTH CORDGRASS, SPARTINA ALTERNIFLORA, FROM SEED IN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2I.
W78-11764

PROCEEDINGS OF THE FEDERAL INTER-AGENCY SEDIMENTATION CONFERENCE, 1963.
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 2J.
W78-11898

AMMONIA DISTRIBUTIONS IN THE SURFACE WATERS OF LIVERPOOL BAY,
University Coll. of North Wales, Menai Bridge. Marine Sciences Labs.
For primary bibliographic entry see Field 5B.
W78-11958

A STUDY OF COPPER, LEAD AND CADMIUM SPECIATION IN SOME ESTUARINE AND COASTAL MARINE WATERS,
Australian Atomic Energy Commission, Lucas Heights.
G. E. Batley, and D. Gardner.
Estuarine and Coastal Marine Science, Vol 7, No 1, p 59-70, July 1978. 1 fig, 4 tab, 26 ref.

Descriptors: *Estuaries, *Heavy metals, *Water pollution, *Analytical techniques, *Pacific Ocean, *Australia, *Water quality, Copper, Lead, Cadmium, Outer Continental Shelf.

The potential of a heavy metal speciation scheme to reflect differences in metal distributions within a water mass was evaluated in a study of soluble copper, lead and cadmium speciation in water samples from five stations in the Port Hacking Estuary (Australia) and one coastal Pacific Ocean station. The observed metal distributions were found to be consistent with the other measured physical and chemical properties of the sampled waters. In all samples, the percentages of metals associated with colloidal matter were high, amounting to 40-60% of total copper, 45-70% of total lead and 15-35% of total cadmium. The scheme was used to follow changes in metal speciation under different sample storage conditions. Storage at 4 degrees C in polythene containers was shown to prevent losses or changes in speciation of the metals studieds. (Sinha - OEIS)
W78-11959

DESORPTION OF RADIOACTIVITY FROM NEARSHORE SEDIMENT,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 5B.
W78-11961

LITTORAL ENVIRONMENT OBSERVATIONS AND BEACH CHANGES ALONG THE SOUTHEAST FLORIDA COAST,
Coastal Engineering Research Center, Fort Belvoir.
A. E. DeWall.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-047 608, Price codes: A08 in paper copy, A01 in microfiche. Technical Paper No 77-10, October 1977. 171 p, 68 fig, 5 tab, 8 append.

Descriptors: *Beach erosion, *Waves(Water), *Resources development, Baseline studies, Florida, Littoral, Coasts, Outer Continental Shelf, Nearshore environment, Environmental impact.

Daily and weekly surveys and observations of the beach and nearshore were made at Jupiter, Boca Raton, and Hollywood, Florida, for 4 1/2 years between 1969 and 1973. During this relatively storm-free period, mean annual breaker height varied from a high of 0.9 meter at Jupiter, the northernmost site, to 0.5 meter at Hollywood, the southernmost site. This decrease in wave energy

reaching the shoreline is attributed to the varying protection afforded by the Bahama Banks, 80 km offshore of Hollywood. Wave and longshore current directions were observed to change seasonally, with directions from the northeast dominating during October through March and from the southeast during April through September. The magnitude of beach changes, as defined by shoreline position and sand volume on the beach, decreased from north to south and is relatively low compared with typical U.S. east coast beaches. Contributing factors include the sheltering effect of the Bahama Banks, the lack of significant storms, and the underlying coquina limestone which characteristically crops out just below the MSL shoreline, forming a protective reef that effectively retards erosion. Beach changes were seasonal in nature, but were reversed at Boca Raton, where beach width and sand volume were highest during the winter months. Seasonal beach changes were two to three times greater than year-to-year changes. (Sinha-OEIS)
W78-11962

SURFICIAL SEDIMENTS AND SEAGRASSES OF EASTERN GREAT SOUTH BAY, N.Y.,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
G. T. Greene, A. C. F. Mirchel, W. J. Behrens, and D. S. Becker.
Special Report No 12, Reference 77-9, January 15, 1978. 33 p, 11 fig, 2 tab, 42 ref, 2 append.

Descriptors: *Sediments, *Grasses, *Baseline studies, Nutrients, Resources development, New York, Outer Continental Shelf, Environmental impact, Mercenaria mercenaria, Zostera marina, *Great South Bay(NY).

During the spring of 1977 a study was conducted of the sediments in eastern Great South Bay from Homans Creek east to Smith Point. A total of 186 stations were sampled in the open bay and in channels, creeks and rivers. Sediments were characterized according to two variables - particle size and organic content. During the summer of 1977 a suvey was made of the distribution and density of seagrasses present in the study area. Most Bay bottom consists of sandy sediments with low organic content. High organic muds were found in the deeper areas of the Bay off Bayport and in Patchoque and Bellport Bays. Distribution of mud and organic content was closely correlated with depth. Gravel content of sediments was usually very low. Somes areas, however, contained high percentages of shell material. Creek sediments were extremely high in mud and organic content. Approximately 1/3 of the Bay sediments were covered with rooted seagrasses, almost exclusively Zostera marina. Estimation of the total biomass of seagrasses in the study area suggested they may play an important role in the nutrient balance of the Bay. The character of sediments in the Bay probably has a large effect on growth, survival and abundance of the commercially important hard clam, Mercenaria mercenaria, and these relationships are discussed. (Sinha-OEIS)
W78-11963

ENTRAPMENT OF SUSPENDED MATERIALS IN THE SAN FRANCISCO BAY-DELTA ESTUARY,
Bureau of Reclamation, Sacramento, CA. Water Quality Branch.
J. F. Arthur, and M. Ball.
U.S. Bureau of Reclamation Report, 'Entrapment of Suspended Materials in the San Francisco Bay-Delta Estuary', April 1978. 118 p, 50 fig, 2 tab, 63 ref.

Descriptors: *Estuarine environment, *Suspended load, *Water quality, Baseline studies, Water pollution, Resources development, California, Outer Continental Shelf, Entrapment, Niomysis mercedis.

Measurements of suspended materials in the upper San Francisco Bay-Delta Estuary, California, made during the 5-year period (1968-1973) preceding the present study, demonstrated that in the Sacramento River system the maximum concentration of phytoplankton, nutrients, and suspended solids occurred in Suisun Bay area. Current theory on sediment transport in estuaries, results of other studies, and data collected in the present study suggest two-layered flow circulation patterns in the freshwater-saltwater mixing zone combined with the flocculation, aggregation, and settling of suspended particles cause suspended materials to accumulate at concentrations exceeding those found either upstream or downstream. The general area where this accumulation occurs has been termed the entrapment zone. This study demonstrated the entrapment zone location fluctuates tidally 2-6 miles (3-10 km) and moves landward with decreasing river discharge. The location of the entrapment zone is related to and can be approximated from salinity concentration, as measured by specific conductance. Total suspended solids (TSS), particulate nutrients, phytoplankton, Neomysis mercedis (Holmes), certain other zooplankton, and juvenile striped bass (young-of-the-year) are concentrated in the zone. (Sinha-OEIS)
W78-11964

THE DYNAMICS OF AN ESTUARY AS A NATURAL ECOSYSTEM,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
For primary bibliographic entry see Field 5C.
W78-11966

THE IMPACT OF SUBTIDAL SEWAGE OUTFALLS ON THE INTERTIDAL MACROFAUNA OF SEVERAL CENTRAL PUGET SOUND BEACHES,
Washington Univ., Seattle.
J. W. Armstrong.
PhD Thesis, 1977. 233 p.

Descriptors: *Outfall sewers, *Intertidal areas, *Estuaries, *Benthic fauna, *Sampling, Shellfish, Invertebrates, Beaches, Sands, Sediments, Sea water, Bioindicators, Bioassay, Water pollution sources, Municipal wastes, Waste water disposal.

The intertidal macrofauna were surveyed over a 21-mo period at five beaches located near municipal outfall sewers in Puget Sound, Washington. The 80 sites, sampled every three months, were characterized by fine-grained wave-rippled sand or cobble-strewn mixed sediments. Sampling yielded 302 species of intertidal invertebrates and fish; infauna and epifauna were screened from sediment samples. The control beach and the beach considered most likely to be affected by the outfall discharges yielded the highest number of species; 10-15% fewer species were obtained from the other sites. Substrate type rather than the extent of pollution controlled the degree of species differentiation; benthic faunal diversity was greater in individual samples than the variability between different beach samples. Saxidomus giganteus and Macoma inquinata collected at the beach most likely to be affected by outfall discharges did not exhibit deteriorated bivalve condition index values; growth rates of Hemigrapsus oregonenesis and S. giganteus were not substantially different from those at other beaches. Although several species of pollution-indicating polychaete feeding types were collected at all beach sites, the proportions were similar at all beaches and not considered to be related to waste disposal. Stepwise discriminant analyses yielded no pollution-related gradients; benthic faunal variations were primarily dependent upon sediment type. (Lisk-FIRL)
W78-12095

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

PROCESS FOR THE PURIFICATION OF INDUSTRIAL EFFLUENTS,
CIBA-GEIGY Corp., Ardsley, NY. (Assignee).
For primary bibliographic entry see Field 5F.
W78-11945

3A. Saline Water Conversion

DESALINATION APPARATUS,
K. F. Ziehm, Jr.
U.S. Patent No. 4,077,849, 6 p, 7 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 968, no 1, p 271, March 7, 1978.

Descriptors: *Patents, *Desalination apparatus, *Water treatment, *Water quality control, *Water purification, Separation techniques, Solar radiation, Solar distillation, Condensers, Solar stills.

Solar heat-absorbing metal members such as balls, rollers or a metal endless belt is employed to initially absorb solar heat in a heating chamber. The metal members pass beneath a transparent cover and become heated through absorption of the solar radiation passing through the cover. The metal members with their latent heat then pass directly into a vaporizing chamber where they are sprayed with sea water or other salt or saline water. The latent heat causes the salt-free water to vaporize. The vapors are condensed by a condenser system such as condenser tubes which pass cooler raw sea water. The condensed vapors are collected; thereby providing substantially purewater. After the metal members pass throught the vaporizing chamber they are encrusted with the salts of the sea water and are immediately rinsed in a rinse tank which is supplied with warm rinse water coming from the condenser tubing. After such rinsing, the rinsed portions of themetal members return to the heating chamber for solar reheating and a repetition of the vaporizing and rinsing functions. (Sinha - OEIS)
W78-11938

REVERSE OSMOSIS SYSTEM WITH AUTOMATIC PRESSURE RELIEF VALVE,
Desalination Systems, Inc., Escondido, CA. (Assignee).
D. T. Bray.
U.S. Patent No. 4,077,883, 7 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 968, No 1, p 280, March 7, 1978.

Descriptors: *Patents, *Desalination, *Water quality control, *Water purification, Reverse osmosis, Semi-permeable membranes, Flow control, Valves.

A restrictor in the form of an elongated small duct or tube is employed for brine or concentrate flow control in a reverse osmosis system. The duct is composed of two portions, one end of one being connected to the brine output of a semipermeable membrane cartridge, while one end of the other is connected to the brine disposal system. The other ends of both these duct portions are connected with the interior of a common compartment which in turn, is connected through a pressure relief or check valve with the purified water collector of the semipermeable membrane cartridge. When the pressure in the purified water collector of the semipermeable membrane cartridge. When the pressure in the purified water collector exceeds the pressure in the compartment, the check valve opens and purified water flows into the compartment and out through the portion of the elongated small duct or tube leading to concentrate disposal. The small diameter duct or tube thereby acts as a restrictor for concentrate of brine flow control and

also for controlling a check or pressure relief valve for pressure control in the purified water collection and storage system. (Sinha - OEIS)
W78-11942

SOLAR POTABLE WATER RECOVERY AND POWER GENERATION FROM SALINOUS WATER,
UOP Inc., Des Plaines, IL. (Assignee).
J. F. Spears, Jr.
U.S. Patent No. 4,078,975, 10 p, 1 fig, 19 ref; Official Gazette of the United States patent Office, Vol 968, No 2, p 646, March 14, 1978.

Descriptors: *Patents, *Desalination, *Desalination processes, *Solar distillation, Separation techniques, Heated water, Saline water, Electric power production, Turbines, Condensation, *Solar radiation heat sink.

A Process for recovering potable water from a source of saline water--e.g. sea and/or ocean water is described. Certain modification afford the simultaneous generation of power. A portion of saline water and an air stream are introduced into a solar radiation heat sink, with the air stream flowing over the saline water. Heated, water containing air is withdrawn from the heat sink and reduced in temperature to recover potable water. The heated water from the heat sink may be recycled or at least in part introduced into a flash separation zone, maintained at a subatmospheric pressure to provide a non-saline vaporous phase which is passed through a turbine, from the resulting motion of which power is generated. The existing turbine vapors are cooled and/or condensed via indirect contact with a second portion of saline water to recover additional potable water. Alternatively, the heated, water-containing air stream may be cooled by vaporizing a hydrocarbon which then passes through a turbine for the purpose of producing energy. Saline water which is returned to the original source is at a temperature not more than 15 degrees F greater than the coldest water obtained from the source. (Sinha-OEIS)
W78-11944

3B. Water Yield Improvement

PRIMARY SOURCES OF SOUTHERN CALIFORNIA'S WATER SUPPLY: HISTORICAL DEVELOPMENT AND SUFFICIENCY IN TIME OF DROUGHT,
Southern California Metropolitan Water District, Los Angeles.
C. Boronkay, and H. Hutchinson.
Los Angeles Bar Journal, Vol. 53, No. 3, p. 136-150 (September, 1977).

Descriptors: *California, *Water supply, *Drought, *Imported water, Water shortage, Water resources, Water transfer, Water storage, Water distribution(Applied), Water management(Applied), Colorado River Aqueduct, Planning.

Without importation of water to augment its water supply, Southern California could not support its present population. This becomes even more apparent with the current crought there. This article reviews the primary sources of Southern California's water supply including their history, physical characteristics and relevant legal decisions. It concludes with a summary of efforts and adjustments being made in an attempt to deal with the current drought. The sources of water supply include the Colorado River, the Owens Valley and the Sacramento -San Joaquin Delta (through the State Water Project). These sources are examined in great detail. Despite these extensive sources, Southern California's population exerts a great demand on the drought-decreased water supply. The history of the drought is traced along with responsive programs and resultant problems. It is concluded that through careful planning and sound water management, Southern California should be able to deal with the drought with minimum inconvenience. To achieve this goal of minimum inconvenience however, 4 conditions must be met. These include: (1) water use reduction; (2) obtaining additional state project water; (3) maintaining flow from the Colorado River Aqueduct; and (4) a normal weather pattern. (Quarles-Florida).
W78-11325

THE PROJECTED IMPACT OF WATER HYACINTH INFESTATION IN TEXAS,
Texas A and M Univ., College Station. Remote Sensing Center.
For primary bibliographic entry see Field 4A.
W78-11605

DEVICE FOR EXTRACTING ENERGY, FRESH WATER AND POLLUTION FROM MOIST AIR,
C. E. Ockert.
U.S. Patent No. 4,080,186, 5 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 968, No 3, p 1064, March 21, 1978.

Descriptors: *Patents, *Water vapor, Precipitable water, Condensation, Atmosphere, Vapor pressure, Vortices, Rotational flow, Structures, Stacks.

The invention relates to the controlled use and exploitation of energy in the heat of vaporization of water vapor in moist air. This device has been given the name 'Tornook' since it utilizes the characteristics of the natural winds known as the Tornado and the Cinook. The particular characteristics utilized are the energetic low pressure vortex and the rapid condensation and precipitation which occur in the Tornado, and the 'Chinook Wind' effect which causes air to be come heated when it is repressurized after being stripped of the moisture content by passing through a region of low barometric pressure. The Tornook comprises a large stack with an extended base, with inlets in the base arranged to impart a rotational velocity to the incoming air which is then accelerated into a tornadic vortex as the flowfield contracts through a transitional plenum region and enters the stack. The resulting lowering of the static pressure provides a density difference which assists in sustaining the flow, and the low pressure also causes a rapid precipitation of the moisture from the air. Energy can be extracted from the rapidly rotating air mass before its rotation is removed and it is repressurized with a consequent heating which maintains a relatively low density as the air passes up through the top of the stack. (Sinha - OEIS)
W78-11949

3C. Use Of Water Of Impaired Quality

MANURE MANAGEMENT IN AN IRRIGATED BASIN RELATIVE TO SALT LEACHATE TO GROUND WATER,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-11632

SYSTEM CURBS NITROGEN IN PLANT-EFFLUENT STREAMS,
Cooperative Farm Chemicals Association, Lawrence, KS.
For primary bibliographic entry see Field 5D.
W78-11767

PROTECTION OF SURFACE WATERS AGAINST EXCESSIVE SALINITY BY MEANS OF SALINE WASTE-WATERS DISCHARGE CONTROL,
Institute for Meteorology and Water Management, Warsaw (Poland).
For primary bibliographic entry see Field 5G.
W78-12040

3D. Conservation In Domestic and Municipal Use

WATER RATIONING: THE VIEW FROM MARIN COUNTY,
Marin Municipal Water District, CA.
For primary bibliographic entry see Field 6E.
W78-11303

DEVELOPMENT OF A REGIONAL INFORMATION SYSTEM FOR HYDROLOGIC MODELING,
Maryland Univ. College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7C.
W78-11379

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: REPORT.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11470

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX B--WATER SUPPLY, DEMAND AND DEFICIT.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11471

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX C--ENGINEERING FEASIBILITY OF ALTERNATIVE WATER SUPPLY PROJECTS.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11472

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX D, VOLUME I--EFFECTS OF WATER SUPPLY DEFICITS IN THE WASHINGTON METROPOLITAN AREA.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11473

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHWESTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX D, VOLUME II--SOCIO-ECONOMIC IMPACT STUDY OF ALTERNATIVE WATER SUPPLY SYSTEMS,
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11474

RESEARCH NEEDS RELATING TO WATER/LAND PROBLEMS IN URBANIZING AREAS.
Illinois Univ. at Urbana-Champaign. Water Resources Center.
For primary bibliographic entry see Field 6B.
W78-11578

SOURCE, USE, AND DISPOSITION OF WATER IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 6D.

W78-11983

INTEGRATING ECOLOGICAL AND SOCIAL CONSIDERATIONS INTO URBAN FLOOD CONTROL PROGRAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 6F.
W78-12014

3E. Conservation In Industry

WATER POLLUTION CONTROL IN METAL FINISHING INDUSTRY,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W78-11380

ECONOMIC ANALYSIS OF PROPOSED AND INTERIM FINAL GUIDELINES - INTEGRATED IRON AND STEEL INDUSTRY,
Temple, Barker and Sloane, Inc., Wellesley Hills, MA.
For primary bibliographic entry see Field 5G.
W78-11491

SYSTEM CURBS NITROGEN IN PLANT-EFFLUENT STREAMS,
Cooperative Farm Chemicals Association, Lawrence, KS.
For primary bibliographic entry see Field 5D.
W78-11767

TOWARD THE EFFLUENT-FREE BLEACHED KRAFT PULP MILL (VERS L'USINE DE PATE KRAFT BLANCHIE SANS EFFLUENT),
Centre Technique du Papier, Grenoble (France).
M. Pichon, and E. Muratore.
ATIP (Association Technique de l'Industrie Papetiere) Revue, Vol 31, No 9, p 324-333, November, 1977. 10 fig, 30 ref, 2 tab.

Descriptors: *Water pollution control, *Kraft mills, Chemical recovery, Pulp and paper industry, Sodium chloride, Bleaching wastes, Industrial wastes, Wastes, Water pollution sources, Water reuse, Recycling, Crystallization, Evaporation, Effluents, Air pollution, Bleaching wastes, Pulp wastes, White liquor(Kraft process), Green liquor(Kraft process).

Water pollution control efforts in modern bleached kraft pulp mills attempt to reduce the volume of bleaching effluents while maintaining the NaCl concentration in the circuits at an acceptable level. Measures for attaining these goals include direct, split-flow, and jump-stage countercurrent recycling of effluents, displacement bleaching, and the use of antipollution bleaching sequences. Processes for eliminating NaCl include crystallization-evaporation of white liquor (Rapson-Reeve process), crystallization of green liquor (Ahlstrom process), purification of electrostatic precipitator dust (MacMillan-Bloedel process), and scrubbing of recovery boiler gases. (Speckhard-IPC)
W78-11899

CLOSED WATER CYCLE SYSTEMS AT PULP AND PAPER MILLS (SISTEMY ZAMKNUTOGO VODOPOL'ZOVANIYA NA PREDPRIATIYAKH OTRASLI),
N. I. Dubitskaya.
Bumazhnaya Promyshlennost', No 10, p 30-32, October, 1977. 5 fig.

Descriptors: *Pulp and paper industry, *Water conservation, Wastes, Industrial wastes, Water pollution sources, Europe, Foreign countries, Recycling, Water, Water reuse, Closed systems, Ukraine, Soviet Union(USSR).

The Ukrainian Giprobum (State Institute for Planning of Pulp and Paper and Hydrolysis Industry Plants) in cooperation with research institutes has developed several closed water cycle systems for pulp and paper mills. Many of these systems are already in operation or are being introduced. Water-recycling systems developed for the following mills are described and illustrated: the Proletarii mill (manufacturing electric insulation board); the Kherson mill (manufacturing pulp and filter paper); the Malin mill (manufacturing capacitor, copying base, and electrolytic medium); and the Zhidachev board mill. All systems considerably reduced the consumption of fresh water and the volume of effluents to be purified. (Stapinski-IPC)
W78-11901

IMPROVED HEAT ECONOMY WITH LOCKMAN PRE-EVAPORATION AT THE HUSUM SULFATE MILL USING DIGESTER FLASH STEAM,
MoDo-Chemetics A. B., Ornskoldsvik (Sweden).
L. Olauson.
Canadian Pulp and Paper Association Technical Section, 64th Annual Meeting (Montreal), Preprints, p A65-A72, January 31-February 3, 1978. 9 fig, 2 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Evaporation, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Foreign countries, Heat exchangers, Steam, Pulp and paper industry, Black liquor, Kraft mills, Sweden, Europe, Evaporators, Water conservation, Energy conservation.

The Lockman multiflash pre-evaporation column is directly connected to the Kamyr continuous digester at a kraft mill of MoDoCell AB. in Husum, Sweden. The evaporator uses the flash steam from the flash tanks as a primary heat source and is directly fed with black liquor from the last flash tank. In the Lockman multiflash evaporator, the black liquor first passes through all the heat exchangers in series and then through the flash chambers in series. The evaporative capacity of the installed unit is 34 tons of water/hr and, based on a 1000-ton/day digester capacity, could easily be increased to 80 tons/hr by adding extra flash chambers to the column. The total requirement of live steam for evaporation is decreased by more than 33% us by using the Lockman column. (Swichtenberg-IPC)
W78-11904

IN-PLANT RECYCLE AND REUSE IN AN INTEGRATED FINE PAPER MILL,
Boise Cascade Corp., Rumford, ME.
D. E. Peakes.
Canadian Pulp and Paper Association Technial Section, 64th Annual Meeting (Montreal), Preprints, p B43-B51, January 31-February 3, 1978. 9 fig, 4 tab.

Descriptors: *Pulp and paper industry, *Water reuse, *Water conservation, Recycling, Water pollution sources, Flow, Suspended solids, Biochemical oxygen demand, Wastes, Industrial wastes, Pulp wastes, Maine, Sampling, Kraft mills, Groundwood mills, Coated paper, Industrial water.

The integrated groundwood/kraft pulp and coated paper mill of Boise Cascade Corp. (Rumford, Maine) instituted in-plant water recycling and reuse systems to reduce flow, suspended solids, and BOD to the effluent treatment plant. A comprehensive in-plant sewer sampling and reporting program provided management with the data needed to minimize losses and to document the effect of the recycle and reuse systems. The process sewer that would eventually be the feed to the effluent treatment plant was reduced from 45 mgpd in 1972 to 23.71 mgpd in September 1977, which is 5% below the treatment plant's design capacity. (Swichtenberg-IPC)

W78-11906

EFFLUENTS FROM PAPER MILLS,
C. A. Roberts.
Effluent and Water Treatment Journal, Vol 12, No 12, p 659-662, December, 1972. 1 fig, 8 ref, 1 tab.

Descriptors: *Pulp and paper industry, *Effluents, Suspended solids, Wastes, Industrial wastes, Water pollution sources, Settling basins, Flotation, Filtration, Wste water treatment, Waste treatment, Water pollution treatment, Sludge disposal, Biochemical oxygen demand, Aerated lagoons, Trickling filters, Activated sludge, Water conservation, Water reuse, Recycling, Water, Consumptive use, Pulp wastes, Closed systems, White water(Paper machines), Paper machines.

Although the paper industry uses large amounts of process water, only about 10% is actually consumed in the papermaking process. Since much of the polluting load of a paper mill effluent results directly from the presence of raw materials in the water, there is strong economic incentrive to recover these materials and recycle them. This has led to an increasing use of recovery systems in the paper-machine white water system. Three devices for recovering suspended solids are discussed, including gravity settling chambers, flotation devices, and mechanical filters. Also discussed are sludge disposal and methods of reducing BOD (long-residence lagoons, aerated stabilization basins, extended aeration, trickling filters, and activated sludge treatment). When discharge regulations are very stringent, there are strong incentives to increase primary in-plant treatment, reduce process water requirements, and increase the water recycle rate. All of these steps approach the ideal goal of a totally closed mill system and reduce water pollution. (Witt-IPC)
W78-11909

COST OF ENVIRONMENTAL CONTROL IN THE PULP AND PAPER INDUSTRY (NAKLADY NA OCHRANU ZIVOTNEHO PROSTREDIA V PRIEMYSLE CELULOZY A PAPIERA),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 5D.
W78-11917

MODERN METHODS OF UTILIZATION OF KRAFT PULP MILL CONDENSATES (WSPOLCZENSNE SPOSOBY ZAGOSPODAROWANIA KONDENSATOW Z CELULOZOWNI SIARCZANOWYCH),
Instytut Celulozowo-Papierniczy, Lodz (Poland).
U. Lubienska.
Przeglad Papierniczy, Vol 34, No 1, p 24-26, January, 1978. 15 ref, 4 tab.

Descriptors: *Pulp wastes, *Condensates, *Kraft mills, *Water reuse, *Waste water treatment, Wastes, Industrial wastes, Pulp and paper industry, Publications, Steam, Black liquor, Evaporation, Recycling, Pulp washing, White liquor(Kraft process), Waste treatment, Water pollution treatment, Water pollution sources, Water purification.

The composition of kraft pulp mill condensates from digester relief, digester blow, and black liquor evaporation, methods of condensate purification (with steam or air), and the recycling of condensates into the production line (for pulp washing and screening and for white liquor preparation) are discussed on the basis of recent pertinent literature. (Stapinski-IPC)
W78-11918

CORROSION IN CLOSED WHITE WATER SYSTEMS,
Institute of Paper Chemistry, Appleton, WI.
For primary bibliographic entry see Field 5C.
W78-11919

ECONOMICAL EXPEDIENCY OF FLOTATION SAVEALL MODERNIZATION (EKONOMICHESKAYA TSELESOOBRAZNOST' MODERNIZATSII FLOTATSIONNYKH LOVUSHEK),
Vsesoyuznyi-Nauchnyi Planovii Otdel Bumazhnoi Promyshlennost, Moscow (USSR).
For primary bibliographic entry see Field 5D.
W78-11926

AUTOMATIC WATER SUPPLY MACHINE (AVTOMAT PODACHI VODY),
Kotlasskii Tsellyulozno-Bumazhnyi Kombinat (USSR).
I. M. Tipunin.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No. 29, p 5-6, October, 1977. 1 fig.

Descriptors: *Water supply, *Water reuse, *Pulp and paper industry, Foreign countries, Recirculated water, Water conservation, Pumps, Freshwater, Pipelines, Valves, Recycling, Water, Automatic control, Electronic equipment, Soviet Union(USSR), Sack paper.

A water supply system for treating sack paper is used at the Kotlas Pulp and Paper Mill (USSR), in which recirculated or fresh water is supplied to the vacuum pump through pipelines by a series of valves pneumatically controlled by a transistorized swith which has an electric-contact manometer. With this system valves in the fresh and recirculated water sulply lines open and close automatically, depending on the supply pressure of either line. The valves can also close the recirculated water pipeline and open the freshwater line, or close the freshwater line and allow only recirculated water to be used in the pulp, or close both the fresh and recirculated lines. (DuVall-IPC).
W78-11927

UTILIZATION OF SCRUBBER WATER FROM LIME RECOVERY FURNACES (UTILIZATSIYA SKRUBBERNYKH VOD IZVESTEREGENERATSIONNYKH PECHEI),
Bratskii Lesopromyshlennyi Kompleks (USSR).
A. V. Slautin, and E. P. Semenova.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No. 31, p 6, November, 1977.

Descriptors: *Pulp wastes, *Kraft mills, *Lime kilns, *Scrubber water, *Water reuse, *Industrial water, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Waste treatment, Filtration, Burning, Pulp and paper industry, Effluents, Lime, Sludge, Bleaching wastes, Gas scrubbers.

About 95% of the particulates emitted from lime kiln furnaces are caught on the scrubbers. Tests have shown that soluble materials in scrubber water (81-86% calcium carbonate, 5-9% calciu oxide, 1.5-2.5% magnesium oxide, 0.8-1.3% silicon oxide, and 0.08-0.09% aluminum oxide) can be used to obtain lime. The content of caustic lime obtained from mud is 87% and that from particulate trapping is 84%. The scrubber water is clarified, and the sludge from the clarifier (39-49% dry) is put on a vacuum filter, mixed with washed white liquor sludge, and delivered to the furnace. The quality of the lime obtained is not changed. Clarified scrubber water can also be used to neutralize acidic bleaching effluents. It has also been proposed that the clarified scrubber water be used to wash lime mud. (DuVall-IPC).
W78-11928

3F. Conservation In Agriculture

PUMPING BILLIONS INTO THE DESERT--THE CASE AGAINST THE CENTRAL ARIZONA PROJECT,
For primary bibliographic entry see Field 6E.
W78-11317

A PARAMETRIC STUDY OF THE VALUE OF HYDROLOGICAL INFORMATION FOR IRRIGATION AND HYDROPOWER MANAGEMENT OF THE FEATHER RIVER,
Econ, Inc., Princeton, NJ.
For primary bibliographic entry see Field 4A.
W78-11456

GRAIN AND FERTILIZER MOVEMENTS IN RESPONSE TO WATERWAY USER CHARGES,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W78-11497

MANAGING FARMLAND TO IMPROVE WATER QUALITY,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Information.
For primary bibliographic entry see Field 5G.
W78-11523

PENETRABLY MOUNTED EMITTER FOR CONDUITS,
Harmony Emitter Co., Inc., Tucson, AZ. (Assignee).
R. C. Harmony.
U.S. Patent No. 4,077,570, 7 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 968, no 1, p 180, March 7, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Water distribution(Applied), Conduit, Application equipment, Flow control, Emitters.

A miniaturized emitter, penetrably mounted within the wall of a conduit having a fluid to be dispensed, emits a constant volume output flow irrespective of changes in fluid pressure within the conduit. An annular flange laterally biased by an inscribed annular pressure chamber sealingly seats the emitter against the wall of the conduit. A pair of downwardly depending skirts having striae on facing surfaces, in combination with the extant pressure on the opposing sides of the skirts, regulate the passage size within the emitter to maintain constant the rate of output fluid flow regardless of presure variations the conduit. (Sinha - OEIS)
W78-11936

FLUID FLOW REGULATOR,
Harmony Emitter Co., Tucson, AZ. (Assignee).
R. C. Harmony.
U.S. Patent No. 4,077,571, 9 p, 14 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 968, no 1, p 180, March 7, 1978.

Descriptors: *Patents, *Irrigation, *Flow control, Irrigation practice, Irrigation efficiency, Application equipment.

Irrigation devices intended for industrial use are generally connected to a source of irrigation water which contains suspended particulate matter. To overcome the clogging effects of the particulate matter, the outlet ports in these devices are generally of resilient material to permit them to expand as necessary to pass the particulate matter. Where a port expands to pass the particulate matter, the rate of water flow simultaneously increases. The increased water flow tends to reduce the water pressure within the common envelope feeding the devices and results in a reduction of water flow through the remaining devices resulting in uneven irrigation. This invention presents a nonclogging requlator that controls the rate of fluid flow from within a fluid conveying conduit regardless of pressure variations within the conduit and irrespective of the presence of particulate matter within the fluid. (Sinha - OEIS)
W78-11937

LAWN SPRINKLER,
Toro Co., Minneapolis, MN. (Assignee).
J. J. Walto.
U.S. Patent No. 4,078,726, 6 p, 9 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 968, No 2, p 566, March 14, 1978.

Descriptors: *Patents, Irrigation, Sprinklee irrigation, Irrigation efficiency, Irrigation practices, Application equipment, Strainers.

A pop-up sprinkler has a vertically extensible and retractable spray head assembly and means for flushing the channel in which the assembly moves with outflowing water both when the assembly extends and when it retracts. The arrangement permits the use of a strainer built into the spray head assembly and replaceable, after installation of the sprinkler by simply removing the spray head. (Sinha - OEIS)
W78-11943

SOURCE, USE, AND DISPOSITION OF WATER IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-11983

AGRICULTURE'S ROLE IN ENVIRONMENTAL QUALITY,
Agricultural Research Service, Beltsville, MD. Agricultural Engineering Research Div.
For primary bibliographic entry see Field 5G.
W78-12081

4. WATER QUANTITY MANAGEMENT AND CONTROL

ANALYSIS OF HYDROLOGIC DATA USING PEARSON TYPE III DISTRIBUTION,
Central Water and Power Research Station, Poona (India).
For primary bibliographic entry see Field 2E.
W78-11423

4A. Control Of Water On The Surface

FEDERAL APPROPRIATION AND THE RECLAMATION ACT OF 1902,
For primary bibliographic entry see Field 6E.
W78-11306

PUMPING BILLIONS INTO THE DESERT--THE CASE AGAINST THE CENTRAL ARIZONA PROJECT,
For primary bibliographic entry see Field 6E.
W78-11317

GENERAL PLAN IMPLEMENTATION: THE GROWTH-PHASING PROGRAM OF SACRAMENTO COUNTY,
California Univ., Davis. Inst. of Governmental Affairs; and California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 6B.
W78-11364

PRELIMINARY RUNOFF AND STREAMFLOW PREDICTIONS IN THE HUMBOLDT RIVER BASIN BASED ON SNOW DISTRIBUTION MEASUREMENTS FROM SEQUENTIAL SATELLITE IMAGERY,
Nevada Univ. System, Reno. Renewable Natural Resources Div.
P. T. Tueller.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 122, Price codes: A03 in paper copy, A01 in microfiche. Desert Research Inst. Pub. No. 43005. Water Resources Center Cooperative Rept. Series Pub. No. AG-2, April 1978. 27 p, 13 fig, 2 tab, 17 ref. OWRT-A-064-NEV(1).

Descriptors: *Sequential satellite imagery, *Runoff, Streamflow predictions, *Nevada, Remote sensing, Forecasting, Snow distribution, *Streamflow forecasting, Measurement, *Humboldt River Basin(Nev).

Since snow does not fall at the same intensity or volume over a given area, it is difficult to extrapolate data to apply over large land areas based upon only a few gaging devices located at various points along a snow course or a single rain gage for an entire valley or mountain range. Based upon past data gathered from the field and subsequent calculations, reasonably accurate figures concerning future water resources can be forecasted from snow course measurements. The objectives of this study were to investigate the feasibility satellite imagery; to develop correlations between snow line changes in the Humboldt River Basin on the 1973 imagery and predicted runoff on various tributaries having streamflow gages; and to develop a preliminary runoff prediction model for the Humboldt River watershed based on these calculations. Preliminary analysis establishes the feasibility of supplementing existing snow course measurement data with temporal LANDSAT evaluations. Recommendations for future research in this area are made, and suggestions are presented for various techniques to aid in accurate predictions. (Smith-Nevada)
W78-11366

THE INVENTORY AND DISTRIBUTION OF WATER AND ASSOCIATED LAND RESOURCES IN THE GARRISON/DEVILS LAKE REGION OF ND: AN APPLICATION OF RESOURCE DATA ACQUIRED BY ERTS,
North Dakota Univ., Grand Forks. Dept. of Geography.
R. D. Mower.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 091, Price codes: A03 in paper copy, A01 in microfiche. North Dakota Water Resources Research Institute, Fargo, Completion Report No. WI-221-047-78, June 1978. 26 p, 1 tab, 6 fig, 22 ref. OWRT A-047-NDAK(1), 14-34-0001-7072.

Descriptors: *Remote sensing, *Land resources, Terrain analysis, Watersheds, Land management, Data collections, *Hydrologic data, Garrison, Satellites(ARtificial), *ERTS, Land use, *North Dakota, *Devils Lake Basin(N Dak).

This study was designed to inventory and spatially analyze water and land resources in the Garrison/Devils Lake Region of North Dakota utilizing resources data acquired by ERTS. Preliminary land use studies in Mercer County involved the interpretation of black and white, and color infrared (CIR) aerial photographic imagery (1:24,000), a LANDSAT color composite image (1:250,000), a Mead Dijit Graphics Generator (DGG) image (1:225,000), and a Mead Digital Laser Printer (DLP) image (1:600,000). Subsequent land use/land cover research in the Devils Lake Basin has included the interpretation and analysis of LANDSAT computer compatible tape (CCT) data using both the General Electric IMAGE 100 Multispectral Analysis System and the Bendix Multispectral Data System (M-DAS). Collaboration between Bendix Aerospace Systems Division and the North Dakota Regional Environmental Assessment Program (REAP), with assistance from the North Dakota Institute for Remote Sensing (UNDIRS), produced a land cover map at a scale of 1:500,000 for the State of North Dakota. The results of this study, in both tabular and graphic format, have been available to various planning agencies in North Dakota and to all special task force units established by the Devils Lake Committee.
W78-11373

INTERNATIONAL SYMPOSIUM ON RISK AND RELIABILITY IN WATER RESOURCES.
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-11386

TAIL BEHAVIOUR OF RIVERFLOW PROBABILITY DENSITIES,
Birmingham Univ. (England). Dept. of Civil Engineering.
N. T. Kottegoda.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources', E.A. McBean, et al. (Eds.), University of Waterloo Waterloo Ontario, Canada, June 26-28, 1978, p 480-498, 1978. 8 fig, 4 tab, 20 ref.

Descriptors: Water resources, *Risks, *River flow, *Stochastic processes, *Probability, Behavior, Equations, Reliability, Gaging stations, Skewness, Nonparametric analysis, Parametric hydrology, Systems analysis, Statistical methods.

Probability densities of riverflow series are nonnormal for physical reasons. Most empirical density functions have positive coefficients of skewness which increase with the closeness of spacing in discrete series. Of particular interest are the distributions of high and low values because tail behavior has an important bearing on performance of water resource systems, reliabilities of yields, and risks involved. Such studies should lead to realistic modeling of extreme events in hydrology. To study extreme behavior, 17 sequences of recorded daily river flows from the U.S. are examined. Gnedenko's statistic and the F distribution are used to test the nature of the tail densities. The significance of departures from the exponential type of probability distribution is determined. The alternative hypothesis denotes either heavy or light tails which decrease to zero at slower and faster rates, respectively, than the exponential type. In addition, stable and Weibull families of distributions are examined. Because results are affected by serial correlation and seasonality, independent residuals are used. Considered also are practical problems such as tail area limits, method of testing, significance levels, and bias. Graphical and theoretical results do not support the theory of heavy tails. (See also W78-11386) (Bell-Cornell)
W78-11388

UNCERTAINTIES IN LAKE MANAGEMENT,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 6A.
W78-11398

STOCHASTIC MODEL OF A FLOOD FORECAST-RESPONSE PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
R. Krzysztofowicz, D. Davis, L. Duckstein, and M. Fogel.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 697-712, 1978. 2 fig, 2 tab, 6 ref.

Descriptors: *Stochastic processes, *Flood forecasting, *Mathematical models, *Markov processes, Evaluation, Flood damage, Rivers, Flood plains, Optimization, Constraints, Costs, Methodology, Decision making, Algorithms, Dynamic programming, Probability, System performance, Uncertainty, *Effectiveness, Systems analysis.

A stochastic model of a Flood Forecast-Response (FFR) process has been developed. The purpose of this model is to provide a means for quantitative evaluation of effectiveness of FFR systems in reducing flood damage. The FFR system is decomposed conceptually into the forecasting system and response system. The sequence of forecasts of the flood crest and the actual river stages are described by means of a Markov process. The flood plain dweller's response to the sequence of forecasts is formulated as a random duration, multistage, discrete-space decision process under uncertainty. A set of measures of effectiveness for evaluating the performance of the FFR system is proposed, and results of a case study are presented. (See also W78-11386) (Bell-Cornell)
W78-11401

THE RELIABILITY OF LOW FLOW REGIONAL EQUATIONS IN BRITISH COLUMBIA,
Water Survey of Canada, Vancouver (British Columbia). Planning and Studies Section.
For primary bibliographic entry see Field 2E.
W78-11403

WET AND DRY PERIODS IN REGIONAL WATER EXCHANGE,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulic and Water Power.
For primary bibliographic entry see Field 6A.
W78-11404

THE DISTRIBUTION OF THE EXTREME OF A MIXTURE RANDOM VARIABLE WITH APPLICATIONS IN HYDROLOGY,
Utah State Univ., Logan. Dept. of Applied Statistics and Computer Science.
For primary bibliographic entry see Field 2E.
W78-11406

ON THE PREDICTION OF EXTREME FLOWS,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-11410

OPTIMAL DESIGN OF RESERVOIRS IN HYDROPOWER SYSTEMS WITH EXPLICIT CONSIDERATION OF RISK,
Technical Univ. of Istanbul (Turkey). Dept. of Civil Engineering.
M. Bayazit.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 874-888, 1978. 5 fig, 19 ref.

Descriptors: *Reservoir design, *Reservoir storage, *Stochastic processes, *Hydropower, *Benefit function, *Benefit maximization, *Operating policy, Simulation analysis, Dynamic programming, Optimization, *Risks, Flow, Methodology, Energy, Dams, Reservoir capacity, Tigris River, Operations research, Equations, Mathematical models.

Storage reservoirs are usually designed and operated on the basis of historical inflows. In such a treatment, it is not possible to incorporate the concept of risk of failure. However, severe economic losses may arise due to the failure of providing the contracted yield. Such losses may be evaluated by using synthetic flow series. Herein, the design of a hydropower storage reservoir is performed using a stochastic approach. The complexity of the structure of inflows, the reservoir operating rule, and the benefit and loss functions do not allow the problem to be solved by analytical methods such as range analysis and stochastic reservoir theory. Therefore, reservoir design is performed by simulation. The loss due to a deficit

a the firm energy production is included in the net benefit function. Various statistics of firm energy deficit are calculated by simulating the operation of the reservoir using a monthly flow model. An empirical operation rule is employed which is later improved by dynamic programming. Thus, the optimum values of the storage capacity and the firm power contract are determined. The size of the reservoir computed by this method is larger than that computed by the conventional method. (See also W78-11386) (Bell-Cornell)
W78-11412

DESCRIPTIVE PROPERTIES OF HYDROLOGY MODELS FOR THE EXPLICIT STOCHASTIC OPTIMIZATION OF MULTI-RESERVOIR OPERATIONS,
Alcan Smelters and Chemical Ltd., Montreal (Quebec).
R. Thompstone, D. K. Sen, and P. Pilon.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 909-924, 1978. 1 fig, 1 tab, 28 ref.

Descriptors: Hydrology, *Mathematical models, *Reservoir operation, *Optimization, *Stochastic processes, Methodology, Risks, Reliability, Probability, Inflow, Seasonal, Equations, Algorithms, Systems analysis, Screening, Descriptive checking, Parameter estimation.

Hydrology models for solving reservoir operating problems may be used implicitly to synthesize a large sample of equi-probable sequences of natural inflows to the system or may be explicitly incorporated in an optimization algorithm. In the latter case, a very simple representation of the complex stochastic process of inflow generation is required to keep the optimization algorithm computationally feasible. This paper applies simplifying assumptions of complete temporal independence and complete spatial dependence of inflows to hydrology models being investigated for an explicit stochastic optimization approach to operating multi-reservoir systems. It presents a methodology for critically analyzing the descriptive properties of such models. Basically, model parameters are estimated using sample inflows, these 'estimated model parameters' and the model-form determine certain 'dictated model parameters', and the dictated model parameters are studied to determine if they are reasonable with respect to the sample data. This analysis is illustrated using a single reservoir, and complete and distributed representations of a multi-reservoir system. The influence of season length is demonstrated for the multi-reservoir cases. The method of analysis presented is preferable to either (1) rejecting such models out of hand for their simplicity, or (2) blindly accepting them because they suit a particular optimization algorithm. (See also W78-11386) (Bell-Cornell)
W78-11414

APPLICATION OF FEATURE PREDICTION MODEL IN HYDROLOGIC TIME SERIES SYNTHESIS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-11416

INCREASED RELIABILITY OF LOW WATER ANALYSES THROUGH SIMULATION OF TIME SERIES,
Coblenz Federal Inst. of Hydrology (West Germany).
For primary bibliographic entry see Field 2E.
W78-11418

CRITICAL DROUGHT REVISITED,
University of Western Ontario, London. Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W78-11419

GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA, REPORT,
Colorado School of Mines, Golden, Dept. of Geology.
For primary bibliographic entry see Field 7C.
W78-11439

ANNOTATIONS OF SELECTED LITERATURE ON NONSTRUCTURAL FLOOD PLAIN MANAGEMENT MEASURES,
Hydrologic Engineering Center, Davis, CA.
For primary bibliographic entry see Field 6F.
W78-11455

A PARAMETRIC STUDY OF THE VALUE OF HYDROLOGICAL INFORMATION FOR IRRIGATION AND HYDROPOWER MANAGEMENT OF THE FEATHER RIVER,
Econ, Inc., Princeton, NJ.
F. Sand.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-27636, Price codes: A11 in paper copy, A01 in microfiche. Report No 75-127-5 August 1975. Prepared for the National Aeronautics and Space Administration, Office of Applications, Washington, DC. 37 fig, 23 tables. NASW-2558.

Descriptors: *Reservoir yield, *Water levels, *Hydrology, *Water utilization, *Hydroelectric power, *Remote sensing, *Reservoir, *Reservoir management(Applied), *Parametric hydrology, Flood control, Flood forecasting, Snowmelt, Rainfall, Water demand, Evaporation, Model studies, *Feather River(CA), *Oroville Dam(CA), *Soil Conservation Service Model, *OROSIM Simulation Model, *Simulation models.

This case study of the Oroville Dam and Reservoir examines the relationship between hydrological forecasts and economic benefits in the area of irrigation and hydropower. Improved accuracy of seasonal basin runoff measurement and a lengthening of the forecast period are necessary factors to lessen power generation constraints and to estimate levels of water elevation in the reservoir. A lessening of power generation constraints can lead to increased production of electricity and more economic gain. Better knowledge of seasonal water supply leads to a maximum yield from planted crops. Regression analysis was used to determine the extent to which improved snowcover measurements could contribute to more precise runoff forecasting. Satellite mapping of the snowcover and improved simulation models are two techniques suggested to improve runoff forecasts. These results are obtained under existing flood control regulations and power generation plans. No large-scale policy changes are suggested, although investigation of the optimal policy with regard to maximizing economic output is warranted. (Coan-NC)
W78-11456

FLOOD PLAIN INFORMATION: MANTUA CREEK, GLOUCESTER COUNTY, NEW JERSEY, CHESTNUT BRANCH AND EDWARDS RUN.
Army Engineer District, Philadelphia, PA.
Prepared for Gloucester County Planning Board, NJ, November 1972, 31 p, 13 fig, 24 plates, 4 tab.

Descriptors: *New Jersey, *Flood profiles, *Flood data, *Peak discharge, *Nonstructural alternatives, Floods, Flood flow, Historic floods, Flow duration, Flood plains, Standard project flood, Flood protection, Flood plain zoning, Warning systems, Building codes, Land use, Planning, *Mantua Creek(NJ), Gloucester County(NJ), *Chestnut Branch(NJ), *Edwards Run(NJ), Floodway design flood.

The study area includes Mantua Creek from its confluence with the Delaware River, its tributaries Edwards Run and chestnut Branch, and their flood plains within Gloucester County, New Jersey. The flood plains are mostly rural, but substantial development exists in an near urban areas. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. Flooding is mainly caused by heavy rainfall, with the main flood season occurring during the late summer and early fall. The Pitman gage, located at Wadsworth Dam and Kressey Lake, has been maintained by the USGS since 1940. The worst flood recorded at the Pitman gage occurred on September 1, 1940, cresting at 75.1 feet, mean sea level (msl) and discharging 4,200 cubic feet per second (cfs). At the same location, the Floodway Design Flood would crest at 73.9 feet msl and would discharge 1,300 cfs, while the Standard Project Flood would crest at 76.2 feet msl and would discharge 3,000 cfs. No structural flood control measures are anticipated in the area. Nonstructural measures are being both used and developed. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-11461

FLOOD PLAIN INFORMATION STUDY: SHENANGO AND MAHONING RIVERS, LAWRENCE COUNTY, PENNSYLVANIA -- SUMMARY REPORT.
Army Engineer District, Pittsburgh, PA.
Prepared for Lawrence County Regional Planning Commission, PA, February 1965, 14 p, 2 fig, 14 plates, 2 tab.

Descriptors: *Pennsylvania, *Flood forecasting *Flood data, *Flood peak, *Flood protection *Non-structural alternatives, *Control structures Floods, Flood plains, Standard project flood Flood plain zoning, Warning systems, Building codes, Land use, Planning, Zoning, Levee, Embankments, Dikes, Floodwalls, Dams, Reservoirs Channel improvement, Floodproofing, *Mahoning River(PA), *Shenango River(PA), New Castle(PA), Lawrence County(PA), Flood plain management, Intermediate regional flood.

The study area includes the flood plains of the Shenango and Mahoning Rivers in Lawrence County, Pennsylvania. The flood plains are densely developed in the vicinity of New Castle and several small towns, but they are otherwise deveoted to non-intensive uses. Flood data were obtained from topographic maps, field studies historical sources, and stream gage records. On both rivers, the worst recorded flood occurred on March 26, 1913, cresting at 209.92 feet mean sea level (MSL) on the Shenango River and 216.84 feet msl on the Mahoning River. One flood control reservoir exists on the Shenango river and another is near completion. Two flood control reservoirs exist on the Mahoning River and another is under construction. The Standard Project Flood (SPF) as modified by these structures, would crest at 207.8 feet msl on the Shenango River and 221.3 feet msl on the Mahoning river. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. Alternative means to accomplish this end are described. Structural means include dams and reservoirs, levees, dikes or floodwalls, channel improvements or watershed treatment. Nonstructural means include channel and floodway encroachment lines, zoning, subdivision regulations, building codes, and flood proofing requirements. (Nessa-NC)
W78-11462

FLOOD PLAIN INFORMATION STUDY: SEWICKLEY CREEK AND JACKS RUN,

HEMPFIELD TOWNSHIP, PENNSYLVANIA--SUMMARY REPORT.
Army Engineer District, Pittsburgh, PA.
Prepared for Hempfield Township Planning Commission, PA, March 1967, 24 p, 7 fig, 14 plates.

Descriptors: *Pennsylvania, *Flood profiles, *Flood data, *Flood protection, *Nonstructural alternatives, *Control structures, Floods, Flood peak, Flood plains, Standard Project Flood, Flood plain zoning, Land use, Planning, Levee, Dikes, Floodwalls, Dams, Floodproofing, Hempfield Township(PA), Westmoreland County(PA), *Jacks Run(PA), *Sewickley Creek(PA), Flood plain management, Intermediate regional flood.

The study area involves the flood plains of Sewickley Creek and Jacks Run in Hempfield Township, Westmoreland county, Pennsyvlania. The Sewickley Creek and Jacks Run flood plains contain mostly non-intensive uses, except in the urban areas. Along Sewickley Creek, developed property subject to flood damage is minimal. The wide flood plain at the confluence of the two streams is especially susceptible to flooding. Flood data were obtained from topographic maps, field studies, historical sources and stream gage records. The worst flood recorded in the study area occurred on October 15, 1954, cresting at 945.6 feet, mean sea level (msl) at the mouth of Jacks Run, and at 930.5 feet msl at the mouth of Sewickley Creek. The only flood control structure in the study area was constructed on Jacks Run in 1960. The Intermediate Regional Flood (IRF), as modified by this structure, would crest at 950.5 feet msl on Jacks Run, while the Standard Project Flood (SPF) would crest at 954.0 feet msl. The same floods on Sewickley Creek would respectively crest at 933.5 and 940.0 feet msl. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-11463

FLOOD PLAIN INFORMATION: WEST FORK RIVER, HARRISON COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Harrison County Planning Commission, WV, November 1976, 33 p, 13 fig, 11 plates, 6 tab.

Descriptors: *West Virginia, *Flood data, *Flood peak, Floods, Flood flow, Historic floods, Flood plains, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Reservoirs, Harrison County(PA), *West Fork River(PA), 100-year flood, 500-year flood.

The study area includes the West Fork river and its flood plain within the limits of Harrison county, West Virginia. Land use in the flood plain is commercial, residential, and industrial. Flood data were obtained from topographic maps, field studies, historical sources and stream gage records. Most serious flooding occurs from December through May and results from heavy rain and snowmelt. The worst recorded flood at enterprise, West Virginia, occurred on March 7, 1967, discharging 36,500 cubic feet per second (cfs) and cresting at 897.5 feet mean sea level (msl). At the same location, the 100-year flood would discharge 50,000 cfs and would crest at 903.9 feet msl, while the 500-year flood would discharge 64,000 cfs and would crest at 908.7 feet msl. Fourteen bridges in the study area would be obstructive to the 100-year flood. A flood control dam is planned for the West Fork River which would reduce major floods by 1 to 2 feet. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-11464

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, CATTARAUGUS COUNTY, NEW YORK.
Army Engineer District, Pittsburgh, PA.
Prepared for Cattaraugus County Planning Commission, NY, August 1976, 36 p, 15 plates, 8 tab.

Descriptors: *New York, *Flood profiles, *Flood data, *Flood peak, *Non-structural alternatives, Floods, Floodwater, Flood flow, Historic floods, Flow duration, Flood plains, Flood protection, Warning systems, Land use, Planning, Control structures, Cattaraugus County(NY), *Allegheny River(NY), 100-year flood, 500-year flood.

The study area includes the Allegheny River and its flood plain in Cattaraugus County, New York. The flood plain is intensely developed in the urban area, but the notable developments are mostly protected by local flood control projects. Flooding may occur at any time of year and results either from rainfall, snowmelt, or both. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The worst flood recorded at the Salamanca gage occurred in June 1972, discharging 76,000 cubic feet per second (cfs) and cresting at 1382.0 feet, mean sea level (msl). At the same location, the 100-year frequency flood would discharge 64,000 cfs and would crest at 1379.6 feet msl, while the 500-year frequency flood would discharge 91,000 cfs and would crest at 1384.0 feet msl. There are no significant obstructions to flood flows. This study is intended for use in making land planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-11465

FLOOD PLAIN INFORMATION: HOBBLE CREEK, SPRINGVILLE, UTAH.
Army Engineer District, Sacramento, CA.
Prepared for City of Springville, UT, June 1973, 28 p, 11 fig, 10 plates, 3 tab.

Descriptors: *Utah, *Flood profiles, *Flood data, *Peak discharge, Floods, Flood flow, Historic floods, Flood frequency, Flood peak, Flow duration, Flood damage, Flood protection, Warning systems, Standard Project Flood, *Hobble Creek(UT), Springville(UT), Intermediate Regional Flood.

The study area involves Hobble Creek and its flood plain in the vincinity of Springville, Utah. Agricultural, residential, and minor commercial and transportation land uses are found on the flood plain; flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. Flooding from cloudburst storms occurs from late spring to early fall. Snowmelt flooding occurs from late spring to early summer; snowmelt causes some of the worst flooding in the area. The worst know flood occurred in 1909, before stream gage records were kept. The worst recorded flood--a snowmelt flood-occurred in May 1952, discharging 1,250 cubic feet per second (cfs) at the Springville gage and flooding about 745 acres. At the downstream study limit, the Intermediate Regional Flood (IRF) would discharge 1,950 cfs and would crest at 4,497.5 feet mean sea level (msl), while the Standard Project Flood (SPF) would discharge 4,550 cfs and would crest at 4,498 feet msl. Twenty of 21 bridges in the study area and a culvert would be obstructive to these flood flows. Structural and non-structural flood control measures have been recommended but not implemented. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-11466

FLOOD PLAIN INFORMATION: LOGAN RIVER, LOGAN, UTAH.
Army Engineer District, Sacramento, CA.
Prepared for City of Logan and Cache County, UT, June 1973, 26 p, 13 fig, 9 plates, 5 tab.

Descriptors: *Utah, *Flood profiles, *Flood data, *Peak discharge, Floods, Flood flow, Historic floods, Flood peak, Flood plains, Standard Project Flood, Flood protection, Warning systems, Land use, Planning, Logan(UT), *Logan River(UT), Cache County(UT), Intermediate Regional Flood.

The study area includes the Logan river and its flood plain in the vicinity of Logan, Cache County, Utah. Land use within the flood plain is currently non-intensive, although residential development is beginning to take place. Neither structural nor non-structural meaures are planned or authorized on a scale commensurate with the damage potential of large floods. Flood data were obtained from topogrqphic maps, field studies, historical sources, and stream gage records. Flooding results from rapid snowmelt and usually occurs from April through June. Cloudbursts are not considered to be a flood threat. The worst flood recorded in the study area occurred in May 1907, discharging 2,480 cubic feet per second (cfs). A large flood in June 1971 discharged 1,680 cfs. At the same location, the Intermediate Regional Flood (IRF) would discharge 2,450 cfs and would crest at 4,655 feet mean sea level (msl) while the Standard Project Flood (SPF) would discharge 2,800 cfs and would crest at 4,656 feet msl. Six of the 10 bridges in the study area are obstructive to flood flow. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-11467

FLOOD PLAIN INFORMATION: BLACKSMITH FORK AND SPRING CREEK, MILLVILLE, UTAH.
Army Engineer district, Sacramento, CA.
Prepared for Cache County, UT, May 1976, 27 p, 12 fig, 16 plates, 6 tab.

Descriptors: *Utah, *Flood forecasting, *Flood profiles, *Flood data, *Peak discharge, *Flood peak, Floods, Flood flow, Indirect flood measurement, Streamflow forecasting, Historic floods, Stage-discharge relations, Flood plains, flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Cache County(UT), *Blacksmith Fork(UT), *Spring Creek(UT), 100-year flood, 500-year flood.

The study area involves the portions of Millville, Nibley, and Providence, and adjoining areas in Cache county, Utah, that are subject to flooding from Millville Canyon Creek, Spring Creek, and Blacksmith Fork. The flood plain consists primarily of agricultural land uses, with some residential and commercial development. Flood data were obtained from topographic maps, field studies, historical sources, and stream gages records for Blacksmith fork. The main flood season occurs from April through September. Flooding results from heavy general rains, intense local thunderstorms, or snowmelt. Ten bridges on Balcksmith fork and 12 culverts on Spring Creek create obstructions to flood flows. There are no flood damage reduction measures in the study area. The maximum recorded peak flow on Blacksmith Fork occurred in May 1917, discharging 1,620 cubic feet per second (cfs); a snowmelt flood in May 1971 had a peak flow of 825 cfs. At approximately the same location, the 100-year flood would discharge 1800 cfs and would crest at 4,471 feet mean sea level (msl), while the 500-year flood would discharge 4,150 cfs and would crest at 4,475 feet msl. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-11468

SPECIAL FLOOD HAZARD INFORMATION REPORT: NORRIS CREEK AND TRIBUTARIES, ABBEVILLE, SC.
Army Engineer District, Savannah, GA.
Prepared for City of Abbeville, and Abbeville County, SC, March 1972, 6 p, 5 plates.

Descriptors: *South Carolina, *Flood data, *Non-structural alternatives, Floods, Indirect flood measurement, Food forecasting, Flood profiles, Flood frequency, Flood peak, Flood plains, Standard Project Flood, Flood protection, Land use, Planning, Floodproofing, Abbeville(SC), Abbeville County(SC), *Norris Creek(SC), Blue Hill Creek(SC), Parker Creek(SC), North Parker Creek(SC), Intermediate Regional Flood.

The City of Abbeville, South Carolina, is drained by Blue Hill and Parker Creeks. The streams converge just east of the city to form Norris Creek. All three watercourses are contained entirely within Abbeville County. Agricultural, residential and commercial uses are found in the flood plain. Most structural flood damage occurs along Blue Hill Creek as it flows through an industrial area of Abbeville. Flood data were obtained from topographic maps, historical sources, and field studies. Stream gage records are not available. Serious flooding occurred in March 1966 after two days of intense rainfall. On Blue Hill Creek, this flood crested at 472 feet, mean sea level (msl) at South Main Street. At the same location, the Intermediate Regional flood (IF) would crest at 473 feet msl. All six of the bridges in the study area would be affected by the IRF flow. The Abbeville Sewage Treatment Plant operations have been stopped three times since March 1960. This report is intended for use in making land use planning and management decisions concerning flood plain utilization. The report recommends no structural flood control works, stressing non-structural measures. (Nessa-NC)
W78-11469

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: REPORT.
Army Engineer Div. North Atlantic, New York.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-A029 533, Price codes: A08 in paper copy, A01 in microfiche. November 1972, 150 p, 98 tab, 49 fig. One of 6 volumes.

Descriptors: *Water supply, *Water supply development, *Regional analysis, *District of Columbia, *Water resources development, *Water management(Applied), Water shortage, Groundwater resources, Groundwater potential, Estuaries, Envionment effects, Low-flow frequency, Low-flow augmentation, Methodology, Aquatic habitats, Water use, Planning, Water demand, Water resources, *Potomac River(DC), *Washington(DC) Metropolitan Area, Upstream storage, Peak demand.

The NEWS study is a response to the mid-'60s water shortages of the Northeast. Its purpose is to prepare a coordinated water supply development and management program for that region. The WMA is one of the first regional metropolitan areas identified for urgent action by the NEWS study. The purposes of the NEWS-WMA study are to provide comprehensive analysis of water supply problems; to generate alternatives; to provide necessary information for agreement on the first step for a survey of a certain project, and if possible, the direction of the next step. Planning objectives are low risk, low cost, flexibility, limited environmental impact, social and economic equity, and growth control. The study finds that water supply for the WMA's water supply system is river-oriented with little storage capacity, a time series approach to deficit analysis is adopted. The baseload component is described in terms of monthly deficits and the peak components are described as 7-day and 1-day deficit increments. Water supply deficits of one month duration or longer are found to be unacceptable; further study of deficits is urged. Efficiency in water usage should be considered of prime importance. Projects are available in the region for early implementation that can meet monthly deficits, and 7-day and 1-day deficit increments. There is an imminent need to select and implement reliable and flexible steps to meet water supply needs; early-action alternatives are specified. Studies involving groundwater yield. The possibility of supply from the Potomac Estuary, continuing evaluation of upstream storage sites, and a refined predicting methodology are suggested. Low flow augmentation to enhance the aquatic habitat of the estuary would be too costly and would constitute an inefficient use of resources. (See W78-11471 thru W78-11474) (Zayac-NC)
W78-11470

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX B--WATER SUPPLY, DEMAND AND DEFICIT.
Army Engineer Div. North Atlantic, New York.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A029 535, Price codes: A05 in paper copy, A01 in microfiche. Nove mber 1975, 75 p, 17 tab, 16 fig. One of 6 volumes.

Descriptors: *Water resources, *Water supply, *Water demand, *District of Columbia, Projects, Programs, Planning, Water supply development, Population, Regional analysis, Water sources, Temporal distribution, Analysis, Water consumption, *Washington(DC) Metropolitan Area, *Water deficits, Potomac River, Annual analysis, 7-day demands, 1-day demands, Demand projections.

This annex describes the assumptions and procedures upon which water supply and demand conditions are based for the WMA as described in Chapter 3 of the main report. The annex is intended as an aid both to the technician and the non-technician in their efforts at technical analysis and basic comprehension, respectively. The first four sections of this Annex present the four main components of supply/demand analysis: a definition of the study area; demand projections; supply base inventories; and supply/demand relations over time. Study area boundaries are first delineated, along with existing water supply systems. Demand projections first review population and water demand projections in order to derive per capita consumptions. Annual and regional demands are then projected in aggregating the data base; calculations of 7-day and 1-day pak demands follow. The supply base is then assembled through an inventory of existing water supply sources and assumed future Potomac River supplies. The final component--supply/demand co-occurrence assumptions--is then discussed after a study of hydrologic element, basic planning criteria, reservoir systems and river systems. The Annex then turns to dealing with the results of the above mentioned supply/demand analysis (i.e., water deficits) and the impacts of project solutions that relate to costs and energy consumption. The deficit analysis looks at temporal distributions of both demand/supply and deficits, and then assays the effects of projects--including upstream rservoirs, local impoundments, raw water interconnections, groundwater withdrawal projects, estuarine water supply, land treatment and indirect use of effluents--on projected deficits. Finally, a procedure for the analysis of programs is outlined. (See also W78-11470) (Zayac-NC)
W78-11471

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX C--ENGINEERING FEASIBILITY OF ALTERNATIVE WATER SUPPLY PROJECTS.
Army Engineer Div. North Atlantic, New York.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A029 536, Price codes: A14 in paper copy, A01 in microfiche. November 1975, 230 p, 26 ref, 70 tab, 79 fig, 5 append. One of 6 volumes.

Descriptors: *Water supply, *Engineering structures, *Project planning, *Economic feasibility, *Groundwater resources, *District of Columbia, Water supply development, Projects, Programs, Alternative costs, Engineer estimates, Reservoirs, Impoundments, Estuaries, Water quality, Effluents, Construction costs, Land treatment, Alternative planning, *Washington (DC) Metropolitan Area, *Potomac River, Raw water interconnections, Waste water reuse, environmental considerations, Water quality objectives.

The purpose fo this Annex is to show 'the engineering feasibility, costs, and certain (environmental and socio-economic) impact information of all water supply projects and alternative programs' for the WMA. Siting, design, and operational characterization of projects were based solely on engineering considerations; to facilitate future review of programs, design and costing of each project were developed to a comparable level of detal. The Annex first studies project types, including upstream reservoirs, local impoundments, raw water interconnections, groundwater withdrawal, indirect wastewater reuse, estuarine water supply and land treatment. Each project type and the associated example project are studied in a format including an introductory discussion of the project type, a description of the specific proposed projects, and a summary evaluation of the project type and/or projects. The Annex then turns to program evaluation as each NEWS program is described and analyzed in terms of the ability of the above mentioned component projects to meet program objectives. Costs noted are present day costs and their use should be restricted to a comparative utility. Bases for construction cost estimates, project components and construction costs and operation and maintenance, standby maintenance, and start-up and shut-down costs for the projects are presented in individual appendices. Basic design criteria such a expected influent or source water quality objectives are presented separately as well. (See also W78-11470) (Zayac-NC)
W78-11472

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX D, VOLUME I--EFFECTS OF WATER SUPPLY DEFICITS IN THE WASHINGTON METROPOLITAN AREA.
Army Engineer Div. North Atlantic, New York.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A029 537, Price codes: A07 in paper copy, A01 in microfiche. November 1975, 127 p, 6 fig, 10 tab, 16 ref. One of 6 volumes.

Descriptors: *Water supply, *Water shortage, *District of Columbia, *Water use, *Water management(Applied), Aesthetics, Economics, Distribution patterns, Distribution systems, Methodology, Tourism, Water sources, Water supply development, Water resources, Planning, *Potomac River, *Water supply deficit, *Washington(DC), Metropolitan Area, Physical effects, Commercial enterprise, Light industry, Low flow allocation.

This first volume of Annex D defines probable short-run socio-physical, aesthetic and other effects of water supply deficits of 10, 20 and 30 percent in the WMA. It then analyzes the information needed to estimate adequately the probable aggregate effects of intermittent water shortages on the water supply and distribution systems of the WMA. Lastly, a methodology to determine losses in the WMA for actual and potential water shortage conditions is developed. This volume is intended to serve as a planning guide for the various water suppliers in the WMA, both in estimating future needs and in allocating short supplies

during emergency conditions. The volume's four major areas of emphasis are: evaluatin of the Metropolitan Washington Council of Governments Emergency Plan; determination of the effects of deficits on water supply systems; estimation of the economic impact of water supply deficits; and a description of social impacts. Projections indicate a 2-week survival of the WMA without serious economic damage for a water supply deficit of up to 30% in the summer, especially in the tourist industry, commercial enterprises and light industries which use large quantities of water. At water supply deficits greater than 30%, rapid money losses would build up. People with the least mobility and resources are found to suffer most from large deficits. Also indicated are interconnections among water supply systems and uniform standby ordinances on restriction of commercial and outside water use. (See also W78-11470) (Zayac-NC)
W78-11473

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHWESTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX D, VOLUME II--SOCIO-ECONOMIC IMPACT STUDY OF ALTERNATIVE WATER SUPPLY SYSTEMS,
Army Engineer Div. North Atlantic, New York.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A029 538, Price codes: A13 in paper copy, A01 in microfiche. November 1975, 227 p, 3 append. One of 6 volumes.

Descriptors: *Social aspects, *Economic impact, *Social impacts, *Projects, *Programs, *Water supply, *District of Columbia, *Water demand, *Water requirements, Environmental effects, Economics, Population, Employment, Income analysis, Income distribution, Regional analysis, Planning, Land use, Recreation, Counties, Cities, Water resources, *Primary impacts, *Secondary impacts, *Washington(DC), Metropolitan Area, Tax base, Potomac River.

This second volume of Annex D of the NEWS-WMA study presents the socio-economic impact of alternative water supply systems considered for the Washington, DC SMSA. five basic programs comprised of combinations of 13 basic projects are discussed. The Annex first develops a statistical base for the SMSA. These data are then used to analyze specific trends for each county (including the District of Columbia) within the area. In those areas where a project is sited, more detailed planning information--derived especially from county planning officials--is presented. This analysis of socio-economic trends is then used as the data base against which project and program impacts are measured. Impacts are measured at the county level; no concerted effort is made to redefine impacts at the local level. The impact analysis presumes that adequate water will be available. The project or program itself is the focus of the impact analysis; the effects of the increased water supply are not studied. Population, employment and personal income are primary indices used to measure these impacts; also used are land use, tax base and recreational opportunities. Each project is considered independently and not in conjunction with others. No attempt is made to measure the impact of water shortage. (See also W78-11470) (Zayac-NC)
W78-11474

HYDROLOGIC INVENTORY AND EVALUATION OF NEVADA PLAYAS,
Nevada System Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2H.
W78-11573

RESEARCH NEEDS RELATING TO WATER/LAND PROBLEMS IN URBANIZING AREAS.
Illinois Univ. at Urbana-Champaign. Water Resources Center.
For primary bibliographic entry see Field 6B.
W78-11578

FEDERAL-STATE WATER USE RELATIONS IN THE AMERICAN WEST: AN EVOLUTIONARY GUIDE TO FUTURE EQUILIBRIUM,
Arizona. Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6E.
W78-11579

ENVIRONMENTAL IMPACTS OF MECHANICAL HARVESTING OF SUBMERSED VASCULAR PLANTS,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5G.
W78-11586

PROCEEDINGS, RESEARCH PLANNING CONFERENCE ON THE AQUATIC PLANT CONTROL PROGRAM, 19-22 OCTOBER 1976, ATLANTIC BEACH, FLORIDA.
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 5G.
W78-11591

OVERVIEW OF THE U.S. ARMY CORPS OF ENGINEERS AQUATIC PLANT CONTROL RESEARCH PROGRAM,
Army Engineers Waterways Experiment Station, Vicksburg, MS.
J. L. Decell.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 8-15, 2 tab.

Descriptors: *Research and development, *Army Engineers, *Aquatic weed control, *Research priorities, *Technology, *Aquatic Plant Control Program, Water hyacinth, Alligatorweed, Hydrilla verticillata, Water lettuce, Eichhornia crassipes, Alternanthera philoxeroides, Pistia stratioties, Chemcontrol, Mechanical control, Biocontrol, Insects, White amur, Ctenopharyngodon idella, Classification, Methodology, Water management, Eutrophication, Water pollution effects.

Research of the U.S. Army Corps of Engineers' Aquatic Plant Control Program provides technology for economical and environmentally acceptable control of aquatic plant infestations in U.S. navigable waters. In 1975 the research program was assigned to the U.S. Army Engineer Waterways Experiment Station (WES) in Vicksburgh, Mississippi, and emphasis was shifted more to operational needs, especially techniques for proper use of control agents. The program was segmented into: (1) identification, assessment, and classification; (2) development of mechanical, biological, chemical, and integrated control technology; (3) development and optimization of application methods; (4) development of management capabilities; and (5) transfer of technology. An objective of each program element is publication of a manual for assessment and classification of aquatic plant problems by field staff, selection of control methods, and predicting probable degree of control. A table is included in this overview listing aquatic plant target species. Problem species most prevalent in high-use areas at present are water hyacinth, alligatorweed, hydrilla, and water lettuce. Research projects include testing of mechanical equipment; evaluation of such biological control agents as white amur (an herbivorous fish), the alligatorweed flea beetle, various water hyacinth endemic pathogens, insect enemies of Eurasian water milfoil and hydrilla; chemical control agents, including slow-release herbicides; and integrated control measures. (See also W78-11591) (Lynch-Wisconsin)
W78-11592

CURRENT STATUS OF THE AQUATIC PLANT CONTROL PROGRAM IN TEXAS,
Army Engineer District, Galveston, TX.
For primary bibliographic entry see Field 5G.
W78-11593

STATUS OF RECONNAISSANCE SURVEY REPORT AND REVIEW OF AQUATIC PLANT PROBLEMS IN THE STATE OF OKLAHOMA,
Army Engineers District, Tulsa, OK.
For primary bibliographic entry see Field 5G.
W78-11594

EAST TEXAS RESERVOIRS--AQUATIC PLANT CONTROL,
Army Engineer District, Fort Worth, TX.
For primary bibliographic entry see Field 5G.
W78-11595

AQUATIC PLANT CONTROL PROGRAM IN THE ST. PAUL DISTRICT,
Army Engineer District, St. Paul, MN.
For primary bibliographic entry see Field 5G.
W78-11596

AQUATIC PLANT CONTROL ACTIVITIES-OHIO RIVER DIVISION,
Army Engineer district, Nashville, TN.
For primary bibliographic entry see Field 5G.
W78-11597

AQUATIC PLANT CONTROL PROGRAM--MOBILE DISTRICT--1976,
Army Engineer District, Mobile, AL.
For primary bibliographic entry see Field 5C.
W78-11598

AQUATIC PLANT PROBLEMS, LAKE SEMINOLE, U.S. ARMY CORPS OF ENGINEERS,
Army Engineer District, Mobile, AL.
For primary bibliographic entry see Field 5G.
W78-11599

SELECTIVE MAINTENANCE CONTROL PLAN, ST. JOHNS RIVER, FLORIDA,
Army Engineer District, Jacksonville, FL.
For primary bibliographic entry see Field 5G.
W78-11600

RESUME--AQUATIC PLANT CONTROL PROGRAM, WILMINGTON DISTRICT,
Army Engineer District, Wilmington, NC.
For primary bibliographic entry see Field 5C.
W78-11601

AQUATIC PLANT CONTROL IN THE CHARLESTON DISTRICT,
Army Engineer District, Charleston, SC.
For primary bibliographic entry see Field 5C.
W78-11602

CONTROL OF WATERCHESTNUT IN NEW YORK STATE,
Army Engineer District, New York.
For primary bibliographic entry see Field 5G.
W78-11603

AUTOMATED PROCESSING OF APC FIELD OPERATIONS DATA,
Army Engineer District, Jacksonville, FL.
For primary bibliographic entry see Field 5G.
W78-11604

THE PROJECTED IMPACT OF WATER HYACINTH INFESTATION IN TEXAS,
Texas A and M Univ., College Station. Remote Sensing Center.
A. R. Benton, Jr.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 75-86, 1 fig, 4 tab, 19 ref.

Descriptors: *Texas, *Water hyacinth, *Aquatic weed control, *Evapotranspiration, *Water loss, *Reservoirs, *Aquatic Plant Control Program, *Water conservation, Economic impact, Florida, Mexico, Eichhornia crassipes, Lakes, Reservoirs, Transpiration, Watersheds(Basins), Water resources development, Arid lands, River basins.

Potential water losses from water hyacinth evapotranspiration in 12 watersheds in east and southeast Texas are estimated at 256,000 ha-m/yr, or 19.5% of the planned yield of all of the reservoirs in the watersheds. Economic valuation of the water loss is $83 million per year. The estimate for water losses is based on the expected future level of infestation. Various factors were considered in determining the potential spread of water hyacinth (Eichhornia crassipes): (1) relative effectiveness of ongoing control programs, (2) high nutrient levels in most watersheds, (3) reservoir construction/infestation relationships, (4) boat trailers, (5) climatic difference, and (6) economic and legislative constraints on plant control. The Texas situation was also compared with trends in Florida and Mexico. Water hyacinth coverage on Texas lakes will reach 20% if the current level of effectiveness and effort per ha. is maintained, or up to 36% if coverage increases without a commensurate increase in control effort or effectiveness. Two major mechanisms account for water loss caused by aquatic plants: (1) transpiration losses in reservoirs, and (2) flow retardance losses in canals. The former has greater relevance to hyacinth infestations. Timmer and Weldon's model of the relationship between solar radiation and transpiration was adopted for prediction in Texas. Tables present evapotranspiration data and water losses for the 12 Texas watersheds in east and southeast Texas. (See also W78-11591) (Lynch-Wisconsin)
W78-11605

THE LARGE-SCALE OPERATIONS MANAGEMENT TEST (LSOMT) WITH THE WHITE AMUR AT LAKE CONWAY, ORLANDO, FLORIDA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5G.
W78-11606

BASELINE DATA REPORT--LAKE CONWAY GRASS CARP PROJECT,
Florida State Game and Fresh Water Fish Commission, Orlando.
For primary bibliographic entry see Field 5G.
W78-11607

AQUATIC MACROPHYTE SAMPLING IN LAKE CONWAY,
Florida Dept. of Natural Resources, Orlando. Bureau of Aquatic Plant Research and Control.
For primary bibliographic entry see Field 5G.
W78-11608

BIOLOGICAL BASELINE STUDIES OF THE LAKE CONWAY, FLORIDA, SYSTEM,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5G.
W78-11609

BACKGROUND WATER-QUALITY ANALYSIS OF LAKE CONWAY,
Orange County Pollution Control Dept. Orlando, FL.
For primary bibliographic entry see Field 5G.
W78-11610

PROPOSED RELATIONSHIPS BETWEEN WHITE AMUR AND THE AQUATIC ECOSYSTEM AT LAKE CONWAY, FLORIDA,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 5G.
W78-11611

CULTURE TECHNIQUES FOR THE PRODUCTION OF MONOSEX WHITE AMUR,
Fish Farming Experimental Station, Stuttgart, AR.
For primary bibliographic entry see Field 5G.
W78-11612

RESPONSE OF HYDRILLA TO VARIOUS HERBICIDES,
Texas Parks and Wildlife Dept., San Antonio. State Wide Noxious Vegetation Control Program.
For primary bibliographic entry see Field 5G.
W78-11613

UPTAKE AND METABOLISM OF DIMETHYLAMINE SALT OF 2,4-D BY FISH,
Syracuse Research Corp., New York.
For primary bibliographic entry see Field 5C.
W78-11614

CHARACTERIZATION AND EVALUATION OF POLYMERS CONTAINING HERBICIDES AS PENDENT SIDE CHAINS,
Wright State Univ., Dayton, OH. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W78-11615

DEVELOPMENT AND EVALUATION OF CONTROLLED RELEASE HERBICIDES,
Creative Biology Lab., Inc., Barberton, OH.
For primary bibliographic entry see Field 5G.
W78-11616

EFFICACY EVALUATION OF CONTROLLED-RELEASE HERBICIDES,
University of Southwestern Louisiana, Lafayette. Dept. of Plant Industry.
For primary bibliographic entry see Field 5G.
W78-11617

PROGRESS IN THE USE OF PLANT PARTHOGENS AS BIOLOGICAL CONTROLS FOR AQUATIC WEEDS,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5G.
W78-11618

PRELIMINARY RESULTS OF INTEGRATING CHEMICAL AND BIOLOGICAL CONTROLS TO COMBAT WATER HYACINTH,
Agricultural Research Service, Fort Lauderdale, FL.
For primary bibliographic entry see Field 5G.
W78-11619

CONTROLLED FIELD TESTS OF SELECTED INSECTS AND PATHOGENS IN COMBINATION ON WATER HYACINTHS,
Army Engineers Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5G.
W78-11620

REMOTE SENSING OF AQUATIC PLANTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 7B.
W78-11621

DATA MANAGEMENT SYSTEMS IN THE AQUATIC PLANT CONTROL RESEARCH PROGRAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 7C.
W78-11622

SIMULATION AND DESIGN OF PUMPED STORMWATER SYSTEMS,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
E. H. Imam, J. A. McCorquodale, and J. K. Bewtra.
Advances in Water Resources, Vol. 1, No. 3, p 157-160, March 1978. 2 fig, 1 tab, 8 ref.

Descriptors: *Storm water, *Urban drainage, *Model studies, Hyetographs, Hydrographs, Energy gradient, Flooding, Damages, Optimization, *Pumped stormwater systems, Surcharge flow, Basements.

Flow and damage in pumped storm water systems were simulated, taking into consideration surcharged flow and basement and street storage. The simulation model was used in a design model to obtain practical global optimum values for the sewer depth, slope, and diameter, as well as sump and pump sizes. (Singh-ISWS)
W78-11878

AN APPLICATION OF THE RUTTER MODEL TO THE ESTIMATION OF THE INTERCEPTION LOSS FROM THETFORD FOREST,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2A.
W78-11887

SEQUENTIAL GENERATION OF MONTHLY STREAMFLOWS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-11889

COMPARISON OF EAST FRACTIONAL GAUSSIAN NOISE AND BROKEN LINE MODELS FOR GENERATING ANNUAL FLOWS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-11890

FIRM OUTFLOW FROM MULTIANNUAL RESERVOIRS WITH SKEW AND AUTOCORRELATED INFLOWS,
Technical Univ. of Lisbon (Portugal). Dept. of Civil Engineering.
L. Valadares Tavares.
Journal of Hydrology, Vol 38, No 1/2, p 93-112, July 1978. 6 fig, 1 tab, 22 ref.

Descriptors: *Reservoirs, *Inflow, *Discharge(Water), *Model studies, Mathematical models, Storage, Storage capacity, Reservoir storage, Markov processes, Monte Carlo method, Mathematics, Equations, Analytical techniques.

Similarity analysis was used to generalize the simulation results on the risk associated with firm outflow from multiannual reservoirs with skew and auto-correlated inflows. General conclusions on the relationship of this risk with the guaranteed outflow, the reservoir capacity and the inflow features (mean, dispersion, skewness and autocorrelation) were obtained and presented. (Sims-ISWS)
W78-11891

MICRO-RELIEF SURFACE DEPRESSION STORAGE: CHANGES DURING RAINFALL EVENTS AND THEIR APPLICATION TO RAINFALL-RUNOFF MODELS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W78-11934

FLOODS IN WESTERN NORTH CAROLINA, NOVEMBER 1977 - A LESSON FOR THE FUTURE,
North Carolina Water Resources Research Inst., Raleigh; Geological Survey, Raleigh. Water Resources Div.; and North Carolina Dept. of Natural Resources and Community Development, Raleigh.
For primary bibliographic entry see Field 2E.
W78-11973

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 3A: SOUTHWEST FLORIDA - SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11974

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 3B: SOUTHWEST FLORIDA - GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11975

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 4: NORTHWEST FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11976

SELECTED HYDROLOGIC DATA, CAMAS PRAIRIE, SOUTH-CENTRAL IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11982

SOURCE, USE, AND DISPOSITION OF WATER IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-11983

FLOOD PROFILES FOR CYPRESS CREEK, WEST-CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11987

PROGRESS REPORT ON HYDROLOGIC INVESTIGATIONS OF SMALL DRAINAGE AREAS IN NEW HAMPSHIRE--PRELIMINARY RELATIONS FOR ESTIMATING PEAK DISCHARGES ON RURAL, UNREGULATED STREAMS,
Geological Survey, Boston, MA. Water Resources Div.
D. R. LeBlanc.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 127, Price codes: A02 in paper copy, A01 in microfiche. Water-Resources Investigations 78-47, 1978. 9 p, 2 fig, 1 tab, 4 ref.

Descriptors: *Floods, *Peak discharge, *Estimating, *Small watersheds, *New Hampshire, Analytical techniques, Regression analysis, Equations, Drainage area, Topography, Streamflow, Flood forecasting, Frequency analysis, Flood recurrence interval.

The magnitude and frequency of floods on rural, unregulated streams in New Hampshire with drainage areas between 0.27 and 622 square miles may be estimated from drainage area, main-channel slope, and a precipitation intensity index. Based on multiple-regression analyses of data from 59 gaged sites in New Hampshire and adjacent areas of bordering states, peak discharges for recurrence intervals of 2, 5, 10, 25, 50, and 100 years can be estimated equations. The estimating relations can be applied to streams where flows are not significantly affected by regulation, diversion, or urbanization; where usable manmade storage does not exceed 4.5 million cubic feet per square mile; or where the basin characteristics are within a specified range. The average standard error of the estimate ranged from 35 percent for the 2-year flood to 58 percent for the 100-year flood. (Woodard-USGS)
W78-11988

AN ANALYSIS OF STREAM TEMPERATURES, GREEN RIVER BASIN, WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 2K.
W78-11989

REGIONAL ANALYSIS OF THE EFFECTS OF LAND USE ON STREAM-WATER QUALITY, METHODOLOGY AND APPLICATION IN THE SUSQUEHANNA RIVER BASIN, PENNSYLVANIA AND NEW YORK,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-11990

INTEGRATING ECOLOGICAL AND SOCIAL CONSIDERATIONS INTO URBAN FLOOD CONTROL PROGRAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 6F.
W78-12014

NONCOMPUTER OPTIMIZATION OF SINGLE-SOURCE NETWORKS,
Visvesvaraya Region Coll. of Engineering, Nagpur (India).
P.R. Bhave.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 104, No EE4, p 700-814, August 1978. 5 fig, 3 tab, 18 ref.

Descriptors: *Water supply, *Water distribution(Applied), *Networks, *Optimization, *Computation, *Cost minimization, Design, Hydraulics, Pipelines, Economic efficiency, Iterative procedure, Pip diameter, Constraints, Capital costs, Equations, Systems analysis.

A procedure, suitable even for hand calculation, is presented for the optimization of single-source water supply systems. The method assumes that all nodal demands are known and that minimal hydraulic gradient level requirements at the nodes are specified. The cost minimization problem is solved through use of an iterative procedure in which the nodal hydraulic gradient levels are initially assumed and successively corrected to satisfy the cost-head-loss ratio optimality criteria developed herein. The diameter is treated as a continous dependent variable and the odd diameter links are replaced by equivalent commercially available pipes. The procedure, illustrated by a design example, is applicable to branched, looping, and combined networks and is found to compare favorably with computer-oriented design procedures. (Bell-Cornell)
W78-12050

4B. Groundwater Management

GROUND-WATER QUALITY VARIATION IN PHELPS COUNTY, MISSOURI,
Forest Service (USDA), Rolla, Missouri, National Forests in Missouri.
For primary bibliographic entry see Field 5B.
W78-11307

INTERNATIONAL AQUIFER MANAGEMENT: THE HUECO BOLSON ON THE RIO GRANDE RIVER,
Waterloo Univ. (Ontario).
For primary bibliographic entry see Field 6E.
W78-11309

GROUNDWATER PROTECTION IN THE CHRISTINA BASIN,
Pennsylvania Univ., Philadelphia. Center for Ecological Research in Planning and Design.
J. Tourbier.
Water and Sewage Works, Vol. 125, No. 1. p. 68-71 (January, 1978). 14 fig.

Descriptors: *Groundwater, *Surface-groundwater relationships, *Infiltration, *Water supply, Delaware, Water resources, Surface waters, Water quality, Runoff, Overland flow, Groundwater resources, Aquifer management.

A water shortage is inevitable if present trends of water consumption without conservation continue. The recent shift of emphasis to the maintenance of groundwater quality ignores the interrelationship and periodic exchanges of water between streams and aquifers. In order to implement groundwater resources protection, solutions acceptable to local governments must be found since most decision-making occurs on the local level. This article examines the adoption of a surface and groundwater drainage code in the Christina (Delaware) Basin. Where the percentage of impermeable surfaces is high, runoff increases and infiltration decreases drastically. Unless the natural processes of purification and infiltration are maintained, water resource problems will continue. The most lucrative solution is to allow development, providing protection measures are taken to keep infiltration o at its natural level. This may be accomplished through several methods including: (1) overland flow; (2) prous asphalt; (3) lattice blocks; (4) dutch drains; (5) seepage areas; and (6) recharge basins. Pertinent federal and local regulations are examined. It is recommended that municipalities develop policies regulating nonpoint source pollution abatement and attempt to induce infiltration. (Quarles-Florida)
W78-11315

CHANGES IN SEEPAGE RATE FROM AN UNLINED CATTLE WASTE DIGESTION POND,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-11335

THE SELECTION AND MANAGEMENT OF FEEDLOT SITES AND LAND DISPOSAL OF ANIMAL WASTE IN BOISE VALLEY, IDAHO,
Boise State Univ., ID.
For primary bibliographic entry see Field 5G.
W78-11340

TOXIC METAL CONCENTRATION OF THE WATER TABLE AS AFFECTED BY POULTRY MANURE,
Delaware Univ., Newark. Dept. of Plant Science.
For primary bibliographic entry see Field 5B.
W78-11370

GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA, REPORT,
Colorado School of Mines, Golden, Dept. of Geology.
For primary bibliographic entry see Field 7C.
W78-11439

HYDROLOGY AND GROUND WATER SUPPLY OF THE BOISE AREA,
Boise Center for Urban Research, ID.
L. L. Mink, and M. LeBaron.
Available from the National Technical Information Services, Springfield, VA 22161 as PB-268 865, Price codes: A03 in paper copy, A01 in microfiche. Report No UO-LCCM-B01-76-006, 1976. 38 p, 11 fig, 1 tab, 21 ref, 2 append. HUD H-2196R.

Descriptors: *Groundwater resources, *Idaho, *Water supply, *Aquifers, Groundwater recharge, Pumping, Irrigation, Infiltration, Water table, Groundwater availability, Hydrology, Domestic water, *Boise(Idaho).

Use of groundwater as a source for domestic water supplies has risen sharply. The quality of such waters, the relative ease with which groundwater can be developed, and its seemingly endless supply of groundwater have attracted increased municipal use. Boise uses groundwater exclusively for domestic water supply. However, little is known about the aquifer or the effects of high volume production on the groundwater system. The aquifer appears capable of meeting Boise's domestic water needs, but questions remain concerning aquifer capacity and how long it will be capable of supplying Boise's domestic water needs. This report provided answers to those questions. (Visocky-ISWS)
W78-11444

FEDERAL-STATE WATER USE RELATIONS IN THE AMERICAN WEST: AN EVOLUTIONARY GUIDE TO FUTURE EQUILIBRIUM,
Arizona. Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6E.
W78-11579

NATURAL SOIL NITRATE: THE CAUSE OF THE NITRATE CONTAMINATION OF GROUND WATER IN RUNNELS COUNTY, TEXAS,
Texas Univ. at Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 5B.
W78-11733

SURVEY OF HUMAN VIRUS OCCURRENCE IN WASTEWATER-RECHARGED GROUNDWATER ON LONG ISLAND,
Brookhaven National Lab., Upton, NY. Dept. of Energy and Environment.
For primary bibliographic entry see Field 5B.
W78-11785

SUBSIDENCE OVER MINES AND CAVERNS, MOISTURE AND FROST ACTIONS, AND CLASSIFICATION.
Available from the National Technical Information Services, Springfield, VA 22161, as PB-272 844, Price codes: A00 in paper copy, A01 in microfiche. Transportation Research Record 612, 1976. 86 p. Zwanig, F.R., editor. $3.60.

Descriptors: *Land subsidence, +Soil science, *Rfost action, *Foundations, *Reviews, *Geologic investigations, Soil investigations, Subsidence, Construction, Highways, Drainage effects, Collapse, Karst, Sinks, Mathematical models, Exploration, Soil classification, Subsurface drains, Surveys, Soil water movement, Frost heaving, On-site investigations, On-site tests, Geologic formations, Weathering.

The 12 papers in this report deal with the following areas: mechanisms of subsidence due to underground openings: induced and natural sinkholes in Alabama--a continuing problem along highway corridors; subsidence control for structures above abandoned coal mines; ground subsubsidence associated with dewatering of a depressed highway section; geologic indicators of catastrophic collapse in karst terrain in Missouri; subsurface cavity detection: field evaluation of radar, gravity, and earth resistivity methods; mathematical model for predicting moisture movement in pavement systems; unsaturated transient and steady-state flow of moisture in subgrade soil; evaluation of freeze-thaw durability of stabilized materials; designations of excavation characteristics for materials identified in field investigations; pore structure of selected Hawaiian Soils; and insulated road study. (Humphreys-ISWS) (See also W78-11866 thru W78-11877)
W78-11865

MECHANISMS OF SUBSIDENCE DUE TO UNDERGROUND OPENINGS,
Georgia Inst. of Tech., Atlanta. Dept. of Civil Engineering.
G. F. Sowers.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification; Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington, D.C., p 2-8, 1976. 5 fig, 8 ref.

Descriptors: *Subsidence, *Land subsidence, *Reviews, *Geologic formations, Faults(Geologic), Aquifers, Porous media, Tunnels, Geology, Groundwater movement, Karst, Drawdown, Dranage effects, Underground openings, Solution channels, Erosion caves, Mines.

Subsidence from underground defects is an increasing problem, and effective preventive or corrective measures depend on knowing the mechanism causing the failure. Too often, however the mechanism is ignored or diagnosed from the appearance of the ground surface, leading to routine indiscriminate treatment such as filling the depression or draining any water, which can be successful, ineffective, or harmful, depending on the mechanism involved. A number of types of openings are involved: open excavations, leaking sewers and culverts, solution channels in limestones, enlarged joints, faults, mines, tunnels, porous lava, erosion caves, voids between boulders, and voids between large debris. The mechanisms responsible include stratum thinning (including consolidation, collapse, or plastic flow), chemical and biochemical action (including burning), lateral strain, loss of lateral support, collapse of an opening, and raveling or erosion. Various combinations of openings and mechanisms can produce similar effects, but the necessary corrective measures are often different. Moreover, subsidences due to other mechanisms ofter resemble those from openings. The evaluation of the causes of subsidence requires a clear understanding of the geology of the soil and rock formations involved, a knowledge of the character of the openings, both natural and man-made, and an awareness of the different mechanisms that can lead to subsidence. (See also W78-11865) (Humphreys-ISWS).
W78-11866

INDUCED AND NATURAL SINKHOLES IN ALABAMA CONTINUING PROBLEM ALONG HIGHWAY CORRIDORS,
Geological Survey, Tuscaloosa, Al., Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-11867

SUBSIDENCE CONTROL FOR STRUCTURES ABOVE ABANDONED COAL MINES,
GAI Consultants, Inc., Monroeville, PA.
R. E. Gray, H. A. Salver, and J. C. Gamble.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classifiction; Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington, D.C., p 17-24, 1976. 7 fig, 2 ref.

Descriptors: *Subsidence, *Pennsylvania, *Coal mines, *On-site investigations, Foundations, Explorations, Mining, Geology, Subsurface investigations, Construction, Grouting, Sinks, Roads, Soil stabilization, Land subsidence.

Subsidence of the ground surface above abandoned coal mines can cause serious damage to highways, buildings and other facilities. Two categories of techniques used in controlling subsidence are selective support for structures and filling of voids caused by past mining operations. The particular method used must be dapted to the local geologic setting and the mining methods that were employed in extracting the coal as well as the support requirements of the structure, because these factors vary within any given site and from one locality to another. This paper presented a case history of subsidence control for an electric substation. The subsurface stabilization techniqus used included drilled piers and piling for support of the structures, and grout columns and dry fly as injection for support of the roadways. During construction, a few small sinkholes formed at the ground surface, indicating the serious subsidence potential. Since the costruction has been completed, no additional sinkholes have formed in the stabilized area. (See also W78-11865) (Humphreys-ISWS).
W78-11868

GROUND SUBSIDENCE ASSOCIATED WITH DEWATERING OF A DEPRESSED HIGHWAY SECTION,
California Dept. of Transportation, Sacramento. Office of Transportation Lab.
J. B. Hannon, and B. E. McGee.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification; Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington, D.C., p 25-30, 1976. 8 fig, 2 ref.

Descriptors: *Land subsidence, *California, *Dewatering, *Highways, Groundwater, Drawdown, Pumping, Excavation, On-site tests, Consolidation, Water levels, Analysis, On-site Investigation, Data collections, Settlement(Structural), Foundations.

Subsidence of land areas adjacent to construction of an interstate highway was reported. Foundation settlements of structures adjacent to a depressed section occurred as a result of pumping groundwater during construction dewatering operations. Preliminary recommendations and actual construction dewatering operations were discussed. The stability of the Sacramento River level and the possibility of piping during high water were significant factors in planning the dewatering operation.

Records of groundwater drawdown for various pumping rates were presented with data from a Ranney well pumping system located in downtown Sacramento; foundation settlement studies for buildings in the adjacent are and specifications for dewatering of the depressed highway section were described. The need for comprehensive laboratory and field tests were discussed. Unforeseen circumstances that developed during the dewatering process required deviation from the scheduled construction operations and continuous monitoring of groundwater and ground surface elevations. It was concluded that the settlement problem could have been minimized had its probability been more fully realized. Groundwater levels should have been monitored more closely during the initial stages of dewatering. Valuable information could have been developed early in the planning stages of this project from drawdown studies using deep wells pumping from a lower, more permeable stratum. (See also W78-11865) (Humphreys-ISWS).
W78-11869

GEOLOGIC INDICATORS OF CATASTROPHIC COLLAPSE IN KARST TERRAIN IN MISSOURI,
Missouri Dept. of Natural Resources, Rolla. Div. of Geology and Land Survey.
For primary bibliographic entry see Field 2F.
W78-11870

SUBSURFACE CAVITY DETECTION: FIELD EVALUATION OF RADAR, GRAVITY, AND EARTH RESISTIVITY METHODS,
Southwest Research Inst., San Antonio, TX.
For primary bibliographic entry see Field 7B.
W78-11871

MATHEMATICAL MODEL FOR PREDICTING MOISTURE MOVEMENT IN PAVEMENT SYSTEMS,
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-11872

UNSATURATED TRANSIENT AND STEADY-STATE FLOW OF MOISTURE IN SUBGRADE SOIL,
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-11873

DESIGNATIONS OF EXCAVATION CHARACTERISTICS FOR MATERIALS IDENTIFIED IN FIELD INVESTIGATIONS,
Tennessee State Dept. of Transportation, Nashville. Div. of Soils and Geologic Engineering.
D. L. Royster.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification; Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington, D.C., p 71-75, 1976. 2 fig, 2 ref.

Descriptors: *On-site investigations, *Soil investigations, *Soil classification, *Earth materials, Subsurface investigations, Excavation, Materials, Geologic investigations, Costs, Soil mechanics, Earthworks, Construction.

A system is described whereby geologic materials could be categorized according to their excavation difficulty during preconstruction field investigations and defines designations of excavation characteristics for each of the types of materials. The system as based on the premise that geologic formations, by their very nature, have rippability characteristics that are traceable, and thus predictable, from one locality to the next. The information obtained within right-of-way limits as a part of geologic mapping would be supplemented by numerous closely spaced auger borings. Examples of road and drainage excavation costs in various geologic environments and of costs of field investigations relative to total project costs were given. (See also W78-11865)(Humphreys-ISWS)
W78-11875

GROUNDWATER POLLUTANTS FROM UNDERGROUND COAL GASIFICATION,
Texas Univ. at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-11884

ANALYTICAL SOLUTIONS FOR TWO-REGIME WELL FLOW PROBLEMS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-11893

EFFECT OF INTRAGRANULAR POROSITY OF COMPACTION,
Illinois Inst. of Tech. Chicago.
For primary bibliographic entry see Field 8E.
W78-11895

WELL STIMULATION AND SYSTEMS FOR RECOVERING GEOTHERMAL HEAT,
For primary bibliographic entry see Field 8B.
W78-11948

MAPS SHOWING GROUND-WATER CONDITIONS IN THE WILLCOX AREA, COCHISE AND GRAHAM COUNTIES, ARIZONA--1975,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11967

MAPS SHOWING GROUND-WATER CONDITIONS IN THE YUMA AREA, YUMA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11968

MAPS SHOWING GROUND-WATER CONDITIONS IN THE EASTERN PART OF THE SALT RIVER VALLEY AREA, MARICOPA AND PINAL COUNTIES, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11969

MAPS SHOWING GROUND-WATER CONDITIONS IN THE WESTERN PART OF THE SALT RIVER VALLEY AREA, MARICOPA COUNTY, ARIZONA--1977,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11970

AVAILABILITY OF GROUND WATER IN THE PISCATAQUA AND OTHER COASTAL RIVER BASINS, SOUTHEASTERN NEW HAMPSHIRE,
Geological Survey, Concord, NH. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11971

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 3A: SOUTHWEST FLORIDA - SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11974

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 3B: SOUTHWEST FLORIDA - GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11975

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 4: NORTHWEST FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11976

GROUND WATER-SURFACE WATER RELATIONS IN THE SILVER CREEK AREA, BLAINE COUNTY, IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
J. A. Moreland.
Idaho Department of Water Resources, Boise, Water Information Bulletin No 45, November 1977. 42 p, 13 fig, 3 tab, 4 ref.

Descriptors: *Surface-groundwater relationships, *Aquifer characteristics, *Water wells, *Water yield, *Springs, Hydrogeology, Groundwater movement, Transmissivity, Withdrawal, Groundwater recharge, Water level fluctuations, Idaho, *Blaine County, *Silver Creek area.

The U.S. Geological Survey studied ground water-surface water relations in the Silver Creek area, Blaine County, Idaho, as part of a comprehensive investigation of the area's water resources. Ground-water withdrawals calculated for 1975 totaled about 16,000 acre-feet of pumped ground water and 12,000 acre-feet of ground water extracted through flowing wells. Nineteen shallow test holes were drilled and cased to define the extent and effectiveness of confining layers in the southern part of the valley. Numerous stream-discharge measurements were made to define areal and temporal distribution of ground-water discharge. Most of the flow in Silver Creek rises from springs discharging from the shallow aquifer near the edge of the confining member. Only a small amount of discharge to the creek is attributable to upward movement of water through the confining member. Discharge from the artesian aquifer near Stanton Crossing may contribute a significant part of the spring flow which feeds the Big Wood River. Seasonal fluctuations in spring discharges are directly related to fluctuations in ground-water levels. (Woodard-USGS)
W78-11978

CHEMISTRY OF WATERS IN THE GEOPRESSURED ZONE FROM COASTAL LOUISIANA -- IMPLICATIONS FOR THE GEOTHERMAL DEVELOPMENT,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2K.
W78-11980

SELECTED HYDROLOGIC DATA, CAMAS PRAIRIE, SOUTH-CENTRAL IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11982

GROUND-WATER STORAGE IN THE JOHNSON VALLEY AREA, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.

J. J. French.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 244, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-130, April 1978. 35 p, 8 fig, 5 tab, 18 ref.

Descriptors: *Groundwater resources, *Alluvial aquifers, *Water quality, *Water storage, *Groundwater recharge, Artificial recharge, Groundwater potential, *California, *Johnson Valley(Calif), San Bernardino County(Calif).

The Mojave Water Agency includes several desert basins where ground water in storage is many times as great as the average annual recharge. The Johnson Valley area in San Bernardino County, Calif., was evaluated for (1) the quantity of ground water in storage, (2) the chemical quality of the ground water, and (3) the potential for storage of recharge water in the unsaturated zone. Johnson Valley contains about 250,000 acre-feet of water in storage, of which about half can be considered recoverable. About 250,000 acre-feet of void space in the unsaturated alluvium is available for storage of imported water, but not all of the recharged water could be recovered. The quality of the water in storage is satisfactory for public consumption, although water from some areas has high floride concentrations and should be mixed with water of low fluoride concentration. (Woodard-USGS)
W78-11984

APPRAISAL OF SHALLOW GROUND-WATER RESOURCES AND MANAGEMENT ALTERNATIVES IN THE UPPER PEACE AND EASTERN ALAFIA RIVER BASINS, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
C. B. Hutchinson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 245, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 77-124, February 1978. 57 p, 14 fig, 8 tab, 34 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water resources development, *Well spacing, *Hydrologic budget, Groundwater recharge, Florida, *West-central Florida, *Eastern Alafia River basin, *Upper Peace River basin, Connector wells.

In southwest Florida, the shallow aquifer system underlying the 1,250-square-mile upper Peace and eastern Alafia River basins is a relatively untapped source of supply. The aquifer system ranges between 50 and 300 feet thick and is composed of a surficial sand unit underlain by a limestone unit. Sand and clay confining beds separate the shallow aquifer system from the highly productive, extensively developed deep aquifer system. The hydrologic budget of the area indicates that annual leakage of water from the shallow to the deep aquifer system is 2.6 inches while annual pumpage from the deep aquifer system averages 5.5 inches. Management alternatives to be considered for efficient use of the shallow ground-water resources include development by withdrawal wells or connector wells for recharge. One solution for a gridded network of wells consists of 540 wells spaced 7,000 feet apart, each producing 453 gallons per minute. The network would derive water to meet demand by capturing water that would normally have run off evapotranspired. (Woodard-USGS)
W78-11985

GEOHYDROLOGIC DATA FROM THE JEMEZ MOUNTAINS AND VICINITY, NORTH-CENTRAL NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11986

NITRATE POLLUTION OF GROUNDWATER FROM NITROGEN FERTILIZERS AND ANIMAL WASTES IN THE PUNJAB, INDIA,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
For primary bibliographic entry see Field 5B.
W78-12076

CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 5E.
W78-12092

NITRATES IN THE UPPER SANTA ANA RIVER BASIN IN RELATION TO GROUNDWATER POLLUTION.
For primary bibliographic entry see Field 5B.
W78-12096

4C. Effects On Water Of Man's Non-Water Activities

BIBLIOGRAPHY ON THE EFFECTS OF PRESCRIBED BURNING AND MAMMAL AND WATERFOWL UTILIZATION OF WETLANDS: ANNOTATED LITERATURE SEARCH WITH SELECTED ABSTRACTS,
Fish and Wildlife Service, Annapolis, MD. Div of Ecological Services.
For primary bibliographic entry see Field 10C.
W78-11385

A 'PEOPLE-COUNTER' FOR UNSURFACED WETLAND FOOTPATHS,
Glasgow Univ., (Scotland). Dept. Geography.
J. R. Rees.
Environmental Conservation, Vol 5, No 1, p 66-68, Spring, 1978. 4 fig, 1 tab, 3 ref.

Descriptors: *Methodology, *Census, Use rate, Wetlands, *Footpaths, Pressure pads.

Wetlands are vulnerable to recreational pressure, and in view of the usually wet substratum bare footpaths will develop and be maintained as a result of visitor pressures that may be considerably lower than those required to produce bare footpaths in drier grass or woodlands areas. A low-cost, battery-operated, pressure-pad people counter was devised to monitor the numbers of people using selected pathways. It is composed of a stout board with a length of rubber tubing pinned to its upper surface. This surface is then covered with the thin rubber sheeting. A length of plastic tubing connects the rubber tubing to the counting meter. The pressure-pad operates satisfactorily when buried just below the soft muddy surface of the footpath. (Stihler-Mass)
W78-11754

EFFECTS OF GRAZING ON A SALT MARSH,
Georgia Univ., Sapelo Island. Marine Inst.
R. J. Reimold, R. A. Linthurst, and P. L. Wolf.
Biological Conservation, Vol 8, No 2, p 105-125, September, 1975. 9 fig, 5 tab, 23 ref.

Descriptors: *Salt marshes, *Primary productivity, *Grazing, *Effects, Georgia, Standing crops, Crabs, Detritus, Livestock, Coastal marshes, Wetlands, Economics, Spartina alterniflora.

Changes in the quantity of plant material in three Georgia salt marsh systems: (1) pristine unaltered marsh, (2) marsh grazed by ungulates, and (3) marsh formerly grazed by ungulates, were measured periodically over two years. All three systems had a mixture of Spartina alterniflora and Salicornia virginica while the latter two also contained Distichlis spicata. Annual production, potential detritus contribution, percent dry weight, mineral concentration, plant species composition, and fiddler crab populations were examined for comparative purposes. Effects of simulated grazing were evaluated at three times of the year in a pure stand of S. alterniflora. An economic assessment and comparison of the three systems was also considered. Average yearly standing crop increments indicated that the aerial plant production for the ungrazed system (583.4 g/sq.m/yr exceeded the production of formerly grazed marsh (221.9 g/sq.m/yr). Detritus production and the number of fiddler crabs were reduced by grazing. Greatest density of plant stems occurred in the area where simulated grazing had occurred in the area where simulated grazing had occurred most recently; lowest stem density was found in the central area. (Stihler-Mass)
W78-11758

EFFECT OF OVERSTORY REMOVAL ON PRODUCTION OF SHRUBS AND SEDGE IN A NORTHERN MINNESOTA BOG,
Forest Service (USDA), Grand Rapids, MN. North Central Forest Experiment Station.
J. M. Brown.
Journal of the Minnesota Academy of Science, Vol. 38, No. 2, 3, p 96-97, 1972. 1 fig, 2 tab, 4 ref.

Descriptors: *Bogs, *Clearcutting, *Vegetations, Effects, Wetlands, *Minnesota, Productivity, *Primary productivity, Shrubs, Sedges.

A vegetation survey three years after the removal of portions of the overstorey showed a decrease in total shrub cover from 9% in forested strips to 7% in clearcut strips. This decrease was accompanied by an increase in frequency of ericaceous shrubs. Sedges increased in both frequency and coverage. Dry weight sedge production was approximately five times greater in clearcut areas than under the original black spruce canopy. (Stihler-Mass)
W78-11760

SUBSIDENCE OVER MINES AND CAVERNS, MOISTURE AND FROST ACTIONS, AND CLASSIFICATION.
For primary bibliographic entry see Field 4B.
W78-11865

MECHANISMS OF SUBSIDENCE DUE TO UNDERGROUND OPENINGS,
Georgia Inst. of Tech., Atlanta. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W78-11866

INDUCED AND NATURAL SINKHOLES IN ALABAMA CONTINUING PROBLEM ALONG HIGHWAY CORRIDORS,
Geological Survey, Tuscaloosa, Al., Water Resources Div.
J. G. Newton.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, andlassification; Transportation Research Record 612, Transportation Research board, National Academy of Sciences, Washington D.C., p 9-16, 1976. 5 fig, 22 ref.

Descriptors: *Sinks, *Alabama, *Highways, *Subsidence, Geologic formations, Land subsidence, Porous media, Collapse, Dewatering, Groundwater, Subsurface drainsm Geology, Carbonate rocks, Karst.Natural sinkholes, Induced sinkholes.

Sinkholes are divided into two categories, induced (man-related) and natural. Since 1900, an estimated 4,000 induced sinkholes or related features have formed in Alabama; fewer than 50 natural sinkholes have been reported. Most induced sinkholes are caused by water-level declines due to pumpage; others result from factors associated with construction. Almost all sinkholes occur

where cavities develop in unconsolidated deposits overlying openings in bedrock. The downward migration of the deposits overlying openings in bedrock. The downward migration of the deposits and the development of the cavities are caused or accelerated by a water-level decline that results in the loss of buoyant support and increases the velocity of water movement, the magnitude of water-level fluctuations, and the induced recharge. Most sinkholes caused by construction are due to the diversion of drainage over openings in bedrock. Many natural sinkholes are caused by the collapse or downard migration of unconsolidated deposits into openings in bedrock. The downward migration that sometimes creates cavities in the deposits results from natural declines in the water table, progressive enlargement by solution of openings in the top of bedrock, or a combination of both. The failure of bedrock roofs over solutionally enlarged openings is a rare occurrence. The time required for the development of natural sinkholes is far greater than that associated with induced sinkholes. (See also W78-11865) (Humphreys-ISWS)
W78-11867

SUBSIDENCE CONTROL FOR STRUCTURES ABOVE ABANDONED COAL MINES,
GAI Consultants, Inc., Monroeville, PA.
For primary bibliographic entry see Field 4B.
W78-11868

GROUND SUBSIDENCE ASSOCIATED WITH DEWATERING OF A DEPRESSED HIGHWAY SECTION,
California Dept. of Transportation, Sacramento. Office of Transportation Lab.
For primary bibliographic entry see Field 4B.
W78-11869

EVALUATION OF FREEZE-THAW DURABILITY OF STABILIZED MATERIALS.
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8G.
W78-11874

PORE STRUCTURE OF SELECTED HAWAIIAN SOILS,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State. Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 2G.
W78-11876

INSULATED ROAD STUDY,
National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.
For primary bibliographic entry see Field 2C.
W78-11877

LITTORAL ENVIRONMENT OBSERVATIONS AND BEACH CHANGES ALONG THE SOUTHEAST FLORIDA COAST,
Coastal Engineering Research Center, Fort Belvoir.
For primary bibliographic entry see Field 2L.
W78-11962

SURFICIAL SEDIMENTS AND SEAGRASSES OF EASTERN GREAT SOUTH BAY, N.Y.,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W78-11963

REGIONAL ANALYSIS OF THE EFFECTS OF LAND USE ON STREAM-WATER QUALITY, METHODOLOGY AND APPLICATION IN THE SUSQUEHANNA RIVER BASIN, PENNSYLVANIA AND NEW YORK,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-11990

FLUVIAL SEDIMENT STUDY OF FISHTRAP AND DEWEY LAKES DRAINAGE BASINS, KENTUCKY - VIRGINIA,
Geological Survey, Louisville, KY. Water Resources Div.
For primary bibliographic entry see Field 4D.
W78-11991

SURFACE MINING AND THE FLOOD OF APRIL 1977,
Northeastern Forest Experiment Station, Berea, KY.
W. R. Curtis.
Research Note NE-248, 1977. 4 p, 2 fig, 1 tab, 6 ref.

Descriptors: *Strip mines, Streams, Storms, *Flash floods, Appalachian Mountain region.

Data from experimental sites in Breathitt County, Kentucky, and Raleigh County, West Virginia, showed that during a major rainstorm on 4 April 1977 streamflow from surface mined watersheds peaked lower than that from adjacent or nearby unmined watersheds. (Forest Service)
W78-12034

EFFECT OF STRIP MINING ON WATER QUALITY IN SMALL STREAMS IN EASTERN KENTUCKY, 1967-1975,
Northeastern Forest Experiment Station, Berea, KY.
For primary bibliographic entry see Field 5B.
W78-12035

RECOVERY OF A DEFORESTED ECOSYSTEM,
Cornell Univ., Ithaca, NY.
G. E. Likens, F. H. Bormann, R. S. Pierce, and W. A. Reiners.
Science Vol. 199, No. 4328, February 3, 1978, p 492-496.

Descriptors: Geochemistry, *Soil chemistry, *Water chemistry, *Forest soils, Deciduous forests, *Clear-cutting, *Vegetation regrowth, Hubbard Brook Experimental Forest, Nutrient cycling, Soil nutrients.

Clearcutting of hardwood forests in New Hampshire causes loss of nutrients from the site both by leaching to streams and by removal of forest products. This raises questions about how fast the site recovers the nutrient loss, and whether repeated cuttings lead to progressive loss of nutrients and reduced site productivity. Studies of the rapid revegetation following the classic experiment on Hubbard Brook Watershed 2, and of other sites in New Hampshire, indicate that nutrient losses from stem-only harvests should be recovered in at most 100 years. Whole tree harvests and short rotations increase the possibility of nutrient depletion. But more rapid recovery cannot yet be counted on because of inadequate knowledge of the nitrogen cycle and mineral weathering and how these are affected by cutting and regrowth. (Forest Service)
W78-12071

4D. Watershed Protection

THE INVENTORY AND DISTRIBUTION OF WATER AND ASSOCIATED LAND RESOURCES IN THE GARRISON/DEVILS LAKE REGION OF ND: AN APPLICATION OF RESOURCE DATA ACQUIRED BY ERTS,
North Dakota Univ., Grand Forks. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W78-11373

IMPACT OF URBAN RUNOFF ON WATER QUALITY IN THE OCCOQUAN WATERSHED,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-11383

MANAGING FARMLAND TO IMPROVE WATER QUALITY,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Information.
For primary bibliographic entry see Field 5G.
W78-11523

WINTER APPLIED MANURE: EFFECTS OF ANNUAL RUNOFF, EROSION, AND NUTRIENT MOVEMENT,
Agricultural Research Service, Morris, MN.
For primary bibliographic entry see Field 5G.
W78-11524

STUDIES OF THE LAKE WINGRA WATERSHED: AN INTERIM REPORT,
Wisconsin Univ.-Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-11532

STREAMFLOW MODELING OF UPPER INDUS RIVER CATCHMENTS,
Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Resources Engineering.
For primary bibliographic entry see Field 2A.
W78-11881

A QUASI-LINEAR SPATIALLY DISTRIBUTED CELL MODEL FOR THE SURFACE RUNOFF SYSTEM,
Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-11882

FLOW GENERATION BY CATCHMENT MODELS OF DIFFERING COMPLEXITY - A COMPARISON OF PERFORMANCE,
University of the Witwatersrand, Johannesburg (South Africa). Hydrological Research Unit.
For primary bibliographic entry see Field 2E.
W78-11888

PROCEEDINGS OF THE FEDERAL INTER-AGENCY SEDIMENTATION CONFERENCE, 1963.
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 2J.
W78-11898

WATER-QUALITY RECORDS FOR THE HUBBARD CREEK WATERSHED, TEXAS, OCTOBER 1974 - SEPTEMBER 1976,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-11981

FLUVIAL SEDIMENT STUDY OF FISHTRAP AND DEWEY LAKES DRAINAGE BASINS, KENTUCKY - VIRGINIA,
Geological Survey, Louisville, KY. Water Resources Div.

W. F. Curtis, R. F. Flint, F. H. George, and J. F. Santos.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A056 573, Price codes: A06 in paper copy, A01 in microfiche. Water-Resources Investigations 77-123, March 1978. 92 p, 28 fig, 9 tab, 50 ref.

Descriptors: *Fluvial sediments, *Sediment transport, *Erosion, *Strip mines, *Sediment yield, River basins, Kentucky, Virginia, Sediment load, Environmental effects, Water quality, Water pollution sources, Bicarbonates, Sulfates, Hardness(Water), Strip mine wastes, Data collections.

Fourteen drainage basins above Fishtrap and Dewey Lakes in the Levisa Fork and Johns Creek drainage basins of eastern Kentucky and southwestern Virginia were studied to determine sedimentation rates and origin of sediment entering the two lakes. The basins ranged in size from 1.68 to 297 square miles. Sediment yields ranged from 2,890 to 21,000 tons per square mile where surface-mining techniques predominated, and from 732 to 3,470 tons per square mile where underground mining methods predominated. Yields, in terms of tons per acre-foot of runoff, ranged from 2.2 to 15 for surface-mined areas, and from 0.5 to 2.7 for underground-mined areas. Water and sediment discharges from direct runoff during storms were compared for selected surface-mined and underground-mined areas. Data points of two extensively surface-mined areas, one from the current project and one from a previous project in Beaver Creek basin, McCreary County, Kentucky, grouped similarly in magnitude and by season. Disturbed areas from mining activities determined from aerial photographs reached 17 percent in one study area where extensive surface mining was being practiced. For most areas where underground mining was practiced, percentage disturbed area was almost negligible. Trap efficiency of Fishtrap Lake was 89 percent, and was 62 percent for Dewey Lake. Average annual deposition rates were 464 and 146 acre-feet for Fishtrap and Dewey Lakes, respectively. The chemical quality of water in the Levisa Fork basin has been altered by man's activities. (Woodard-USGS)
W78-11991

PESTICIDE RUNOFF LOSSES FROM SMALL WATERSHEDS IN GREAT LAKES BASIN,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
For primary bibliographic entry see Field 5B.
W78-12009

EROSION OF SURFACE-MINE SPOILS,
Northeastern Forest Experiment Station, Berea, KY.
W. R. Curtis, and M. J. Superfesky.
In: Proceedings of the 32nd Annual Meeting of the Soil Conservation Society of America, 'New Directions in Century Three: Strategies for Land and Water Use', August 7-10, 1977. Richmond, Virginia, p 154-158, (1977), 8 fig, 5 ref.

Descriptors: *Strip mines, *Bank erosion, *Soil profiles, *Topography, Appalachian Mountain region.

Erosion from head-of-hollow fills and from sites reclaimed to their original contour was studied. The effects of time, precipitation, and slope position were considered. Erosion on back-to-contour totaled 32.93 mm over twenty months. Erosion from the hollow fill over twenty-six months totaled 23.83 mm. Long uninterrupted spoil slopes were conducive to formation of rills and gullies. (Forest Service)
W78-12033

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

POLYCHLORINATED BIPHENYLS TOXIC POLLUTANT EFFLUENT STANDARDS,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-11319

FATE OF TRACE ELEMENTS IN SEWAGE SLUDGE-AMENDED SOILS,
Dayton Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W78-11363

INTERACTING ENVIRONMENTAL FACTORS WHICH CONTROL THE SINKING RATE OF PLANKTONIC ALGAE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W78-11365

CHARACTERIZATION OF NUTRIENTS AND ALGAL BLOOMS AT ABIQUIU AND COCHITI RESERVOIRS,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11367

SELENIUM IN SOUTH DAKOTA GROUND AND SURFACE WATER,
Geological Survey, Vermillion, SD.
R. L. Stach.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 051, Price codes: A04 in paper copy, A01 in microfiche. South Dakota Water Resources Inst., Brookings, Completion Report, May 1978. 68 p, 1 fig, 23 tab, 9 ref, append. OWRT A-066-SDAK(1), 14-34-0001-7088.

Descriptors: *Selenium, *Groundwater, Standards, Pollutants, Surface water, Public health hazards, *South Dakota, Water quality standards, Nitrates, *Water analysis, *Pollutant identification, Sampling.

The South Dakota Geological Survey in conjunction with the South Dakoka Agricultural Experiment Station collected and analyzed 586 water samples for selenium. Of these samples 47 or 8 percent of the samples exceeded the drinking water standard of 10 parts per billion. Over ninety percent of the selenium in solution was in the form of selenate. A significant correspondence was found between high nitrate levels and high selenium levels. The current hypothesis is that oxidizing conditions control the distribution of both selenium and nitrate. This hypothesis explains why 79 percent of the samples having anomalous nitrate levels also have anomalous selenium levels. The main source of selenium appears to be the Pierre Shale. The high selenium concentrations are found in shallow aquifers which are usually unconfined. (Wiersma-So Dak St).
W78-11371

PREPARATION AND ANALYSIS OF WATER SEDIMENT AND PLANT SAMPLES FOR METALS,
South Dakota State Univ., Brookings. Dept. of Chemistry.
D. C. Hilderbrand.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 123, Price codes: A02 in paper copy, A01 in microfiche. South Dakota Water Resources Institute, Brookings, Completion Report, May 1978, 6 p. OWRT A-057-SDAK(1), 14-34-0001-7087.

Descriptors: *Trace elements, Spectroscopy, Sediments, Plant tissues, Analysis, *Metals, *Pollutant identification, Potable water, *Bottom sediments, Chromium, Cadmium, Lead.

Two aspects of analysis of water systems for metals were investigated: (1) Analysis of drinking water supplies for potentially toxic materials with the objective of developing suggested procedures for these elements, and (2) sampling bottom sediments for metal analysis. The three elements studied in detail were chromium, cadmium and lead. Arsenic was less thoroughly investigated. The recommended methods give satisfactory results. All procedures studied to obtain a representative bottom sediment sample failed. Poor reproducibility is due to the inhomogeneity of the sample and incomplete dissolution of the metal content of the sample. (Wiesma-So Dak St).
W78-11372

HYDROSPHERIC TRACE ELEMENTS AND THEIR APPLICATION IN TRACING WATER POLLUTANTS,
Oregon State Univ., Corvallis. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-11375

AN IMPROVED SOIL-SAMPLING PROCEDURE FOR THE PREDICTION OF DISSOLVED INORGANIC PHOSPHATE CONCENTRATIONS IN SURFACE RUNOFF FROM PASTURE,
Massey Univ., Palmerston North (New Zealand). Agricultural and Horticultural Sciences.
A. N. Sharpley, J. K. Syers, and R. W. Tillman.
Journal of Environmental Quality, Vol 7, No 3, p 455-456, 1978. 3 fig, 1 tab, 3 ref.

Descriptors: *Phosphates, *Agricultural runoff, *Soil analysis, *Sampling, *Phosphorus compounds, Fertilizers, Water pollution sources, Leaching, Phosphorus, Nutrient removal, Water pollution, Runoff, Chemical analysis, Storm runoff, Leachate, Pastures, Analytical techniques, Surface runoff, *Dissolved inorganic phosphates, *Phosphate transport, *Soil sampling procedure, *Surface-runoff plots, Soil sampling.

Linear relationships were obtained between the mean concentration of dissolved inorganic phosphate (DIP) in each of several surface-runoff events and the amounts of inorganic P extracted by 0.1M NaCl from the top 1 cm of soil sampled prior to the event. These relationships were similar for both unfertilized and fertilized, undrained pasture. This contrasted with the data obtained in the previous year for the same surface-runoff plots, receiving the same treatments, where markedly different linear relationships were obtained using a 0-5 cm soil-sampling depth. The modified soil-sampling procedure provides more generally applicable method of predicting the concentration of DIP in surface runoff from pastures of widely differing P status. (Henley-ISWS)
W78-11432

EARTH RESOURCES DATA ACQUISITION SENSOR STUDY, PERIOD: DECEMBER 1, 1974-MAY 31, 1975,
Alabama Univ., Huntsville. School of Graduate Studies and Research.
E. W. Grohse.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-30637, Price codes: A04 in paper copy, A01 in microfiche. Final Report, July 1975. 54 p, 1 fig, 3 tab, 46 ref, 5 append. NASA NAS8-31169.

Descriptors: *Monitoring, *Water quality, *Rivers, *Streams, Remote sensing, Satellites(Artificial), On-site data collections, Equipment, Sampling, Air pollution, Sulfur compounds, Pollutants, Water pollution, Water chemistry, Turbidity, Dissolved oxygen, Biochemical oxygen demand, Hydrogen ion concentration, Hardness(Water), Water temperature.

This preliminary study concerned itself with the investigation of the minimum data collection and data processing requirements for the development of 'smart' water monitoring systems, which disregard redundant and irrelevant data and process only those data predictive of the onset of significant pollution events. Two approaches were immediately suggested: (1) adaptation of a presently available 'smart' ambient air monitoring system developed by TVA, and (2) consideration of a 'smart' air, water, and radiological monitoring system developed by the Georgia Tech Experiment Station. In order to apply 'smart' monitoring systems, threshold values and maximum allowable rates of change of critical parameters such as dissolved oxygen and temperature are required. Hopefully, these will be determinable through STORET and other sources of water quality data, which are presently being investigated. (Sims-ISWS)
W78-11443

WATER QUALITY ASSESSMENT YAKIMA RIVER BASIN,
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 5B.
W78-11450

USE OF BIOLOGICAL INDICATOR ORGANISMS TO QUANTITATE ORGANOCHLORINE POLLUTANTS IN AQUATIC ENVIRONMENTS - A REVIEW,
Uppsala Univ. (Sweden). Dept. of Zoology.
D. J. H. Phillips.
Environmental Pollution, Vol. 16, p 167-229, 1978. 12 fig, 6 tab, 188 ref.

Descriptors: *Bioindicators, *Chlorinated hydrocarbon pesticides, *Polychlorinated biphenyls, *Chemical analysis, Pollutant identification, Bioassay, Pesticide residues, Water analysis, Analytical techniques, Path of pollutants, Organic compounds, Pesticides, Insecticides, Teleosts, Mollusks, Marine mammals, Crustaceans.

The use of biological indicator organisms to monitor the comparative pollution of aquatic areas by organochlorine compounds (the organochlorine insecticides and the polychlorinated biphenyls) by means of their organochlorine content is reviewed. The results of surveys using such indicator organisms may be affected by parameters other than the comparative abundance of organochlorine pollutants at each location studied. These interfering parameters include those concerning the organisms sampled (body lipid, age, size, or weight, sex, and the sexual cycle interactions of accumulated organochlorines affecting retention and storage of these compounds, and diet) and those concerned with the environments from which the organisms were sampled (chemical interactions or metabolism of organochlorines before uptake by the chosen indicator organisms, salinity and water temperature). Each parameter may, in some instances, influence survey results by differentially affecting organisms sampled at different locations. In addition, each parameter may interact in a complex fashion with one or more of the other interfering variables. It is concluded that the use of any biological organism to elucidate the comparative pollution of different locations by organochlorines, or even to monitor changes in the available organochlorine concentration at any one location with time, is open to criticism. The effects of the interfering parameters cited above may be far more important in determining the concentrations of organochlorines in the chosen indicator organisms than is the relative aboslute abundance of organochlorines in the ambient surroundings. (EIS-Deal)
W78-11540

THE EFFECTS OF INTERMITTENT CHLORINATION ON TEN SPECIES OF WARM-WATER FISH,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 5C.
W78-11544

STRESS RESPONSE OF COHO SALMON (ONCORHYNCHUS KISUTCH) ELICITED BY CADMIUM AND COPPER AND POTENTIAL USE OF CORTISOL AS AN INDICATOR OF STRESS,
Oregon Cooperative Fishery Research Unit, Corvallis.
For primary bibliographic entry see Field 5C.
W78-11546

DETERMINATION OF VOLATILITY AND CHEMICAL PERSISTENCE OF LIPID-SOLUBLE HALOGENATED ORGANIC SUBSTANCES IN MARINE ORGANISMS,
Central Inst. for Industrial Research, Oslo (Norway).
G. Lunde, J. Gether, and E. Steinnes.
Ambio, Vol. 5, No. 4, p 180-182, 1976. 2 tab., 15 ref.

Descriptors: *Pollutant identification, *Pesticide residues, *Chlorine, *Bromine, *Iodine, *Methodology, *Lipids, Path of pollutants, Halogens, Organic compounds, Chemical analysis, Chlorinated hydrocarbon pesticides, Stability, Polychlorinated biphenyls, *Chemical persistence, Lipid soluble halogenated compounds.

This paper describes an application of a new method for determination of total levels of organic bound halogens in biological material. The total content of organic bound chlorine, bromine, and iodine was determined prior to and after treatments of lipids from marine organisms with hexane/sulfuric acid. They were similarly measured in volatiles isolated from the same organisms by cyclohexane/steam codestillation. The results obtained were compared to the level of polychlorinated biphenyls (PCB) for these organisms. In both untreated and sulfuric-acid-treated lipids, most of the chlorine could not be accounted for as known compounds. (EIS-Katz)
W78-11548

DAPHNIA MAGNA AS A BIOASSAY SYSTEM FOR HISTAMINE IN TUNA EXTRACTS,
California Univ., Davis. Inst. of Marine Resources.
E. R. Blonz, and H. S. Olcott.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 44, No. 5, p 517-519, 1978. 1 fig, 1 tab, 19 ref.

Descriptors: *Bioassay, *Daphnia, *Fish physiology, Animal metabolism, Biochemistry, Organic compounds, Public health, Human diseases, Human pathology, Biodegradation, Toxicity, Quality Control, *Tuna, *Histamine.

Live Daphnia were subjected to varying concentrations of aqueous extracts from three lots of commercially canned tuna. Two of the lots had been identified as causing 'scombroid poisoning', and contained high histamine (Hm) levels. The third was a control lot of store-bought tuna. The extract of the control fish was used either alone or with the addition of Hm at levels equalling or exceeding the Hm concentrations in the other two lots. Twenty Daphnia per group were exposed for 60 minutes: response (loss of activity or infrequent twitching) were recorded at ten minute intervals. The response increased with time, and was dependent upon the concentration of Hm present-regardless of source. LD50's for the various time and concentration gradients are shown. The method might be useful in quality control testing. (EIS-Deal)
W78-11551

EXPERIMENTAL STUDIES ON THE ACCUMULATION OF COPPER AND ZINC IN THE GREEN MUSSEL,
National Institute of Oceanography, Panjim (India).
For primary bibliographic entry see Field 5C.
W78-11564

PERIPHYTON BIOMASS OF ATTACHED ALGAE AND BIOLOGICAL ESTIMATION OF WATER POLLUTION LEVEL USING ATTACHED DIATOMS IN THE CHIKUMA RIVER AND ITS TRIBUTARY, NAGANO PREFECTURE (IN JAPANESE),
Freshwater Fisheries Research Lab. Tokyo (Japan).
For primary bibliographic entry see Field 5C.
W78-11571

WISCONSIN TRIBUTARY LOADINGS TO THE UPPER GREAT LAKES,
Wisconsin Dept. of Natural Resources, Madison. Div. of Environmental Protection.
For primary bibliographic entry see Field 5B.
W78-11628

COMPARISON OF MANUAL (GRAB) AND VACUUM TYPE AUTOMATIC SAMPLING TECHNIQUES ON AN INDIVIDUAL AND COMPOSITE SAMPLE BASIS.
National Fielld Investigations Center-Denver, CO.
For primary bibliographic entry see Field 7B.
W78-11630

COHERENT MICROSCOPY AND MATCHED SPATIAL FILTERING FOR REAL-TIME RECOGNITION OF DIATOM SPECIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Physics.
S. K. Case.
Environmental Science and Technology, Vol 12(8), 1978, p 940-946. 17 fig, 16 ref.

Descriptors: *Methodology, *Monitoring, Water pollution effects, Phytoplankton, Algae, *Diatoms, *Microscopy, Plant grouping, Plant morphology, Plant populations, *Pollutant identification, Matched spatial filtering.

A method of image enhancement and real-time input of diatoms into an optical pattern recognition system is described. The system is designed to identify and count diatoms as a means of water pollution assessment. The method consists of directing a low-power laser beam into a microscope to produce a magnified coherent image of the specimen. (EIS-Katz)
W78-11641

A RAPID METHOD OF DETERMINING MAXIMUM PERMISSIBLE CONCENTRATIONS OF TOXICANTS IN LAKE AND STREAM FISHERIES,
Moscow State Univ. (USSR).
N. S. Stroganov.
Hydrobiological Journal, Vol 12(4), 1976, p. 83-86, 5 ref. (translated from Russian).

Descriptors: *Toxicology, *Daphnia, *Bioassays, Mortality, *Methodology, Commercial fisheries, Freshwater fish, *Monitoring, Laboratory tests, Laboratory equipment, Statistical methods.

The author describes a method of determining the maximum permissible concentration of toxic substances in lake and stream fisheries, based on their toxicity for D. magna, the organisms most sensitive to toxic agents. The survival rate and fecundity of the daphnids in a 30-day experiment are the tests for toxicity. The method is 40 to 80 times more economical of time and money than the comprehensive method previously suggested by the author. It also speeds up the process of setting preliminary fishery MPC. (EIS-Katz)
W78-11642

THE COMMON MUSSEL MYTILUS EDULIS AS AN INDICATOR OF POLLUTION BY ZINC, CADMIUM, LEAD AND COPPER. I. EFFECTS OF ENVIRONMENTAL VARIABLES ON UPTAKE OF METALS,
Melbourne Univ., Parkville (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-11644

DER QUEEKSILBERGEHALT IN MUSKELN DES KARPFENCYPRINUS CARPIO L. - ALS INDIKATOR DER WASSERVERUNREINIGUNG (THE MERCURY CONTENT OF CARP (CYPRINUS CAPRIO L.) MUSCLES AS AN INDICATOR OF WATER PURIFICATION,
Institut fuer Meereslebensmittel Technologie, Szezecin (Poland).
A. Chodyniecki, and M. Protaswicki.
Acta Hydrochimica et Hydrobiologica, 1978, Vol. 6, p 175-179, 1 tab, 1 fig, 12 ref. (German).

Descriptors: Metals, *Mercury, *Carp, Fresh water fish, Path of pollutants, Water pollution effects, *Commercial fish, Commercial fisheries, Public health, Aquiculture, Bioassay, Methodology.

A laboratory bioassay with carp showed a positive correlation between the mercury content of the water and in the fish flesh. No strong evidence was observed that the mercury content of the fish muscle was dependent on the weight of the fish. (EIS-Katz)
W78-11657

A FLOW-THROUGH TESTING PROCEDURE WITH DUCKWEED (LEMNA MINOR L.),
Environmental Research Lab.-Duluth, MN.
C. T. Walbridge.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 586, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-77-108, September 1977. 20 p, 5 fig, 27 ref.

Descriptors: *Bioassay, *Aquatic plants, *Methodology, Plant nutrition, Growth regulators, Toxicity, Water pollution effects, Plant regulators, Growth rates, Testing, Pollutants, Lemna minor, *Plant responses, Laboratory plant, *Proportional dilutors.

Lemna minor is one of the smallest flowering plants. Because of its floating habit, ease of culture, and small size it is well adapted for laboratory investigations. Procedures for flow-through tests were developed. Testing procedures were developed with this apparatus. By using the techniques described here, the effects of nutrients or toxicants, singly or in combination, can be determined in several concentrations with several replicates of each. Responses which can be measured include changes in growth rate, changes in death rate, changes in timing of division of colonies, color, changes, changes in variability, and modification of the flowering response. Emphasis here is on changes in growth rate determined either by daily frond counts or by final frond numbers. (EIS-Katz)
W78-11660

USE OF FRESHWATER MUSSELS TO MONITOR POINT SOURCE INDUSTRIAL DISCHARGES,
Eastern Michigan Univ., Ypsilanti. Center for Aquatic Biology.
For primary bibliographic entry see Field 5B.
W78-11670

EFFECTS OF ORGANIC FRACTIONS FROM SECONDARY EFFLUENT ON SELENASTRUM CAPRICORNUTUM (KUTZ),
Rensselaer Polytechnic Inst., Troy, NY.
For primary bibliographic entry see Field 5C.
W78-11678

EFFECTIVENESS OF AN ARTIFICIAL SUBSTRATE FOR SAMPLING MACROINVERTEBRATES IN SMALL STREAMS,
California Univ., Berkeley. Dept. of Forestry and Conservation.
K. B. Roby, J. D. Newbold, and D. C. Erman.
Freshwater Biology, Vol 18, p 1-8, 1978. 4 fig, 2 tab, 28 ref.

Descriptors: *Sampling, *Benthic fauna, *Invertebrates, *Artificial substrates, Streambeds, *On-site data collections, Equipment, Aquatic habitats, Biological communities, *Spatial distribution, Benthos, Methodology, Bottom sampling, On-site investigations, Larvae, *Surber sampler, Colonization, *San Leandro Creek(California).

Factors affecting invertebrate colonization of samplers consisting of twenty-five 5-cm diameter porcelain balls were studied in small northern California streams. Peaks in diversity, in number of individuals and in taxa, occurred after 2-4 weeks in each of four 10-week colonization runs. Most variation in number of organisms was correlated with increases in organic detritus. Time was the second most important variable. The average coefficient of variation in total numbers collected from the artificial sampler was 0.40, slightly less than the average 0.56 for the Surber sampler. Published coefficients of variation for artificial substrates range from 0.109 to 0.849, which are similar to values reported from work with the Surber sampler. The authors had several practical difficulties with the artificial substrates. Samplers were lost, became clogged or buried, supported vertebrate predators and were costly. The samplers also collected some organisms in greater proportions than their occurrences in the natural substrate. In sampling small streams these disadvantages (compared to a Surber sampler) outweigh the slight reduction in sampling variability. (EIS-Katz)
W78-11679

ABSENCE OF ARYL HYDROCARBON HYDROXYLASE (AHH) IN THREE MARINE BIVALVES,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
J. H. Vandermeulen, and W. R. Penrose.
Journal of the Fisheries Research Board of Canada, Vol 35, p 643-647, 1978. 1 fig, 3 tab, 17 ref.

Descriptors: *Oil, *Enzymes, *Animal metabolism, *Animal physiology, *Clams, *Brook trout, *Brown trout, *Food chains, Oil pollution, Path of pollutants, Oil spills, Metabolism, Organic compounds, Water pollution effects, Aromatic compounds, *Crude oil, Tissue analysis, Bivalves, Bioaccumulation, *Depuration.

Bivalves exposed to short-term (4d) and long-term (6 y) oil pollution were assayed for aryl hydrocarbon hydroxylase (AHH) and N-demethylase activity. None of the bivalves showed any basal or petroleum-hydrocarbon-induced aryl hydrocarbon hydroylase or N-demethylase activity, as shown by their inability to metabolize benzopyrene or imipramine. In contrast, oil-free control trout and trout taken from a polluted lake readily metabolized both these compounds. The inability of the bivalves to degrade petroleum aromatic hydrocarbons and the tendency of these compounds to accumulate in their tissues present an opportunity for transfer of unaltered hydrocarbons into the food chain. (EIS-Deal)
W78-11692

EFFECTS OF AROCLOR 1248 AND 1260 ON THE FATHEAD MINNOW (PIMEPHALES PROMELAS),
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5C.
W78-11695

THE LEVELS OF METALS IN DOCK-YARD SEDIMENTS WITH PARTICULAR REFERENCE TO THE CONTRIBUTIONS FROM SHIP-BOTTOM PAINTS,
University of Manchester Inst. of Science and Technology (England). Pollution Research Unit.
E. G. Bellinger, and B. R. Benham.
Environmental Pollution, Vol. 15, p. 71-81, 1978. 1 fig., 4 tab., 18 ref.

Descriptors: *Metals, *Copper, *Lead, *Tin, *Zinc, Methodology, Chemical analysis, Chemical wastes, Fouling, Paints, Ships, Docks, Sediments, Water pollution effects, Toxicity, Genetics, Marine algae, *Marine animals, Dock-yard sediments, *Ship-bottom paints, England, Liverpool, Tilbury, Manchester.

Levels of the metals copper, lead, tin and zinc have been determined in a range of ship-bottom paints by atomic absorption spectrophotemetry. Copper, lead and zinc have been similarly determined in sediments taken from enclosed dock-basins at Liverpool, Tilbury and Manchester. At each of the dock-yards concentrations of all the metals were elevated in the vicinity of dry-docks. These elevations are believed to be due to the presence of residues from the ship-bottom paints. The amount of copper and zinc, which are major components of antifoulant paints, in the amount aostate extracts correlate closely with the levels in the nitric acid digests; lead, which is found mainly in anticorresive and primar paints, does not. Direct toxic effects of the metals to marine organisms are considered, but are not thought to be important in view of the large dilution and dispersal capacities usually available. The possibility of organisms developing genetic resistance to heavy metals in enclosed dock-basins is discussed. It is noted that many of the dock-yard organisms are components of the ship-fouling ecosystem, so that the premature exposure to the toxins of antifoulant paints may result in the development of toxin resistance of considerable economic importance. (EIS-Katz).
W78-11708

CONTROL OF CHIRONOMIDS IN MILKFISH (CHANOS CHANOS) PONDS WITH ABATE (TEMEPHES) INSECTICIDE,
Taiwan Fisheries Research Inst., Tainan. Fish Culture Station.
For primary bibliographic entry see Field 5G.
W78-11711

INTERACTION OF CHEMICAL POLLUTANTS AND VIRUS IN A CRUSTACEAN: A NOVEL BIOASSAY SYSTEM,
Environmental Protection Agency, Gulf Breeze, FL. Gulf Breeze Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W78-11712

BIOCHEMICAL CORRELATES OF DISSOLVED MERCURY UPTAKE BY THE OYSTER OSTREA EDULIS,
Southampton Univ. (England). Dept. of Oceanography.

For primary bibliographic entry see Field 5C.
W78-11716

METABOLISM OF AROMATIC HYDROCARBONS IN MARINE ORGANISMS,
National Marine Fisheries Service, Seattle, WA.
For primary bibliographic entry see Field 5C.
W78-11717

EFFLUENTS FROM CATFISH PONDS DURING FISH HARVEST,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
C. E. Boyd.
Journal of Environmental Quality, V. 7, No. 1, p. 59-62, Jan.-Mar., 1978. 2 fig., 2 tab., 13 ref.

Descriptors: *Fish farming, *Catfishes, Chemical properties, Nitrates, Chemical oxygen demand, Biochemical oxygen demand, Phosphorus, *Water pollution, *Effluent quality, Settleable solids, Seining, Draining.

Data on effluent quality during catfish harvest were obtained from ponds on Fisheries Research Unit, Auburn University Agricultural Experiment Station, Auburn, Alabama, during the fill of 1976. Settleable matter concentrations never exceeded the suggested instant-aneous maximum level (3.3 ml/liter) during the draining phase of fish harvest. Concentrations of other water quality parameters in effluents during this time were typical of those found in catfish ponds in autumn, BOD, COD, and total phosphorus levels were lower in waters of catfish ponds during the fall than the summer, but concentrations of most measured parameters, including settleable matter, in effluents were higher than corresponding levels in small streams draining agricultural or forested watersheds near Auburn, Alabama. Although water quality is poor in catfish ponds during summer months, Alabama ponds seldom lose appreciable quantities of overflow water during the summer. It was found that water quality deteriorated greatly during the seining phase of fish harvest. Settleable matter values usually exceeded the suggested maximum. Rates of discharge of pollutants other than nitrates were proportionally greater during the seining phase. Considerable reduction of pollutants could be implemented by not releasing water during the seining phase. (Merryman-East Central).
W78-11719

ACUTE TOXICITY OF NITRITE TO LARVAE OF THE GIANT MALAYSIAN PRAWN, MACROBRACHIUM ROSENBERGII,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 5C.
W78-11723

IMPROVED PLANKTON NET BUCKET,
Nalco Environmental Sciences, Northbrook, IL.
For primary bibliographic entry see Field 7B.
W78-11727

SUBMERGED PERIPHYTON SAMPLER,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 7B.
W78-11728

FUNNEL TRAP FOR COLLECTING LITTORAL AQUATIC INVERTEBRATES,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
For primary bibliographic entry see Field 7B.
W78-11734

LOW-COST, LARGE-VOLUME AIR SUPPLY FOR EXPERIMENTAL TANKS,
Ohio State Univ., Columbus. Museum of Zoology.
For primary bibliographic entry see Field 7B.
W78-11736

THE EFFECTS OF OIL ON LOBSTERS,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
For primary bibliographic entry see Field 5C.
W78-11739

INSTRUMENTATION FOR BIOLOGICAL MONITORING OF INDUSTRIAL WASTES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. Cairns, K. L. Dickson, and G. F. Westlake.
In: Proceedings of the International Seminar and Exposition on Water Resources Instrumentation. R.S. Krizek and E. F. Mosonyi, eds. 1975, p. 538-547, Ann Arbor Scientific Publishers, Inc. Ann Arbor, Mich. 6 fig, 13 ref.

Descriptors: *Methodology, *Monitoring, Laboratory tests, Laboratory equipment, Aquatic environment, *Laboratories, *Instrumentation, Environmental control, Fish physiology, Fish behavior, Toxicity, Algae, Diatoms, *Biological monitoring, *Biological techniques, In-plant monitoring.

Two biological monitoring systems have been developed to generate information rapidly. One system measures changes in the movement and breathing of fish in order to provide an early warning of developing toxicity in the wastes of an industrial plant. The other system measures changes in the diversity of algal (diatom) communities in streams by means of laser holography. The instrumentation, incorporation, properly used, will enable management to match waste discharges to non-degrading environmental assimilative capacity for the site specific conditions then in existence and to respond to daily and seasonal changes in assimilative capacity. (EIS-Katz)
W78-11740

A TECHNIQUE FOR PREDICTING IN-STREAM FLOW REQUIREMENTS OF BENTHIC MACROINVERTEBRATES,
Montana Univ., Missoula. Dept. of Zoology.
J. A. Gore.
Freshwater Biology, Vol 3, p. 141-151, 1978. 5 fig, 4 tab, 27 ref.

Descriptors: *Benthic fauna, *Streamflow, Velocity, Currents(Water), Streams, Invertebrates, Coals, Strip mines, Habitats, Water utilization, Water demand, Water requirements, *Riffles.

A total of 225 benthic samples was taken at various riffles along the Tongue River in Montana during three separate weekly intervals in 1975. For each sample, depth, current velocity, substrate microprofile, turbulence (Froude number), and the number and kind of species present were considered. The conditions of highest faunal diversity were 75-125 cm/s current velocity at 20-40 cm depth. The optimum condition appeared to 76 cm/s at a depth of 28 cm over medium cobble substrates. The centroids for optimum conditions of depth and current velocity for thirty-six common macroinvertebrates are also presented. Representative diagrams of the tolerance ranges of some common vertebrates are presented. A method for applying these data to produce a minimum flow recommendation is Jiscussed. If the optimum conditions can be plotted on composite hydrologic maps of depth and velocity in riffle areas at various discharges, one can predict the discharge at which the optimum conditions are eliminated and, thus, the recommeded minimum discharge. (EIS-Katz)
W78-11744

FLOW-THROUGH COLLECTION BUCKET FOR LARVAL FISH,
Tennessee Valley Authority, Norris. Div. of Forestry, Fish and Wildlife Development.
For primary bibliographic entry see Field 7B.
W78-11746

SAND DOLLAR EMBRYOS AS MONITORS OF ENVIRONMENTAL POLLUTANTS,
Trinity Coll., Hartford, CT.
R. B. Crawford, and A. M. Guarino.
The Bulletin, Mount Desert Island Biological Laboratory, Vol 16, p. 17, 1976.

Descriptors: *Bioassay, *Toxicity, Mortality, *DDT, Marine animals, Benthos, Invertebrates, *Phenol, Juvenile stages, Eggs, Growth stages, Embryonic growth stage, Laboratory tests, Water pollution effects, *Bioindicators, *Pentachlorophenol, *Malathion, *Aminotriazole, *Sevin, *Toxiphene.

Embryos of the sand dollar Echinarachnius parma were used to determine the toxicity of pentachlorophenol, malathion, aminotriazole, phenol, Sevin, toxaphene and DDT. Gametes of sand dollars are suitable for determining toxicity. (EIS-Katz)
W78-11747

ORGANIC CONTAMINANTS IN WATER.
Effluent and Water Treatment Journal, Vol 18, No 7, p 311, July, 1978.

Descriptors: *Analytical techniques, *Sampling, *Tertiary treatment, *Potable water, *Gas chromatography, Mass spectrometry, Polychlorinated biphenyls, Pollutant identification, Toxins, Computers, Municipal wastes.

The EPA has retained Battelle Columbus Laboratories in Ohio for a 3-yr $1.5 million survey of contaminants in drinking water and tertiary effluents. The water analysis will focus upon a number of toxic substances, such as 2,3,7,8-tetrachlorodibenzo-p-dioxin and polychlorinated biphenyls. Toxic organic compounds will be identified by gas chromatography-mass spectrometry; a computer will be used to match unidentified spectra with reference sample spectra. An integration of the specific ion current system will be employed to quantify the compounds. Drinking water and tertiary effluent samples from six regional areas in Texas, California, and the District of Columbia will be tested, as well as samples from Miami, Florida; New Orleans, Louisiana; Ottumwa, Iowa; Philadelphia, Pennsylvania; and Seattle, Washington. (Lisk-FIRL)
W78-11757

CONTINUOUS FLOW DOSAGE OF FLUORINE: COMPARISON OF COLORIMETRIC AND POTENTIOMETRIC METHODS (DOSAGE EN 'FLOW CONTINU' DU FLUOR: COMPARISON DE METHODES COLORIMETRIQUE ET POTENTIOMETRIQUE),
Institut d'Hygiene, Geneva (Switzerland).
J-C. Landry, and F. Cupelin.
Mitteilungen aus dem Gebiete der Lebensmitte luntersuchung und Hygiene, Vol. 60, No. 1, p 56-73, 1978. 10 fig, 1 tab, 21 ref.

Descriptors: *Fluorides, *Fluorine, *Aluminum, *Colorimetry, Pollutant identification, Electrodes, Cations, Analytical techniques, Beryllium, Fallout, Sodium compounds, Silicates, Chemical analysis, Salts, Industrial wastes.

Colorimetric and potentiometric methods were developed for the continuous-flow quantification of fluoride in fall-out from aluminum factories. Fluorine fall-out from these factories has been successfully controlled by solid captors bearing sodium silicate. The colorimetric technique complexes fluoride ions in two main flow circuits with

the salt of lanthanum (III) alizarine-3-methyl-N,N-diacetic acid, buffered at pH 4.6. The detection limit for fluoride in the first circuit ranges over 0.5-10.0 micrograms/ml; dilution of an aliquot from the first circuit permits the linear representation of fluoride concentrations in the range from 0.5-60.0 micrograms. The potentiometric technique utilizes a fluoride ion selective electrode. Of the complexing agents tested for fluoride ion selective electrode. Of the complexing agents tested for fluoride ions adsorbed on the electrode's crystal surface, a 0.1 M solution of beryllium cations was preferred. Following contact with the continuous flow, the crystal surface of the electrode is rinsed rapidly by a dual delivery system on the electrode and a retarding circuit. Close correlation was observed between the colorimetric and the potentiometric data. (Lisk-FIRL)
W78-11768

CHARACTERIZATION, TREATMENT, AND DISPOSAL OF WASTEWATER FROM MARYLAND SEAFOOD PLANTS,
Maryland Univ., College Park. Center for Environmental and Estuarine Studies.
For primary bibliographic entry see Field 5D.
W78-11770

CUPRIC-ION MONITOR USING ION-SELECTIVE ELECTRODE FOR INDUSTRIAL EFFLUENT, (IN JAPANESE),
Hiroshima Univ. (Japan). Dept. of Engineering.
K. Nakajima, T. Ishizuka, K. Tanaka, and H. Sunahara.
Reports of the Government Industrial Research Institute, Nagoya, Vol 27, No 5, p 151-156, May, 1978. 9 fig, 2 tab, 6 ref.

Descriptors: *Electrodes, *Copper, *Ions, *Metals, *Selectivity, Spectrometry, Theoretical analysis, Acidity, Absorption, Chlorides, Temperature, Waste water treatment, Chemical analysis, Analytical techniques, Industrial wastes, Water analysis.

A cupric-ion selective electrode was incorporated into a monitor designed to measure the copper concentration of industrial effluents. Using a dilute standard solution containing 0.1-0.0000001 M of copper, the electrode potential measurements exhibited little deviation over a 17-day period. In solutions where the ionic strength was held constant, the measured potential was directly proportional to copper concentration in the solution. Values obtained with the monitor were closely correlated with theoretical predictions. While the measured electode potentials appeared proportional to the temperature of the sample solution, the values did not correspond with theoretical calculations. The measured potential decreased with increasing pH, indicating an optimum sample solution pH range of 1-3. Electrode performance was adversely affected by the presence of chloride ions; interference was not extensive in the presence of dilute solutions containing various concentrations of surfactants. The electrode performance with industrial effluents was evaluated by comparison with atomic absorption spectrometry. (Lisk-FIRL)
W78-11775

HYDROCARBON EMISSIONS FROM REFINERY WASTEWATER AERATION,
For primary bibliographic entry see Field 5D.
W78-11779

TMP EFFLUENTS: A REVIEW,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong, D. Breck, and J. Costantino.
Tappi, Vol. 61, No. 8, p 19-22, August, 1978. 3 fig, 3 tab, 14 ref.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Toxicity, *Mortality, *Biochemical oxygen demand, Wood wastes, Hardwood, Softwood, Steam, Vapor pressure, Aerated lagoons, Pollutant identification, Water pollution sources, Waste water treatment, Industrial wastes.

Pollutants in thermomechanical pulping effluent were measured and compared to those of stone groundwood pulping effluent. Refined pulp samples were washed in a one-step laboratory procedure for quantification of BOD, COD, toxicity emission factor (TEF) and 50% fish mortality values over 96 hrs. Full-scale and pilot plant samples of spruce/balsam pulp effluents contained 13-34 kg BOD/ton pulp and had a FEF range of 115-540; Jack pine pulp effluents ranged from 12-28 kg BOD/ton pulp and had a FEF from 835-4160. Southern pine effluent was characterized by a BOD of 20 kg/ton and a TEF of 1950; aspen pulping effluent had a BOD of 8 kg/ton and a FEF of 150 while southern hardwoods contained 25 kg BOD/ton and 220 TEF. Both thermomechanical pulping and stone groundwood pulping effluents had the same toxicity in the case of spruce/balsam; stone groundwood effluent had A slightly higher average BOD. At high steaming pressures of about 690 kiloPascals, the resulting loss of wood materials produced a higher BOD loading; the BOD content of thermomechanical effluent was not dependent upon the wood species. Most of the toxicity and BOD load was released during the first stage of the two-stage pulping operation; little toxicity or BOD loading was associated with chip washing. Effluent from the plug screw feeder, pulp cyclone condensates, and pulp bleaching contributed little to the pollutant load. Aerated lagoons with a 5-day retention time were found to reduce BOD in the effluent by 70-75% and adequately detoxify the wastes. (Lisk-FIRL)
W78-11780

AIR-POLLUTING EFFECT OF ACTIVATED-SLUDGE WASTEWATER TREATMENT PLANTS (ELEVENISZAPOS SZENNYVIZTISZTITOK LEVEGOSZENNYEZO HATASA),
M. Szabo, L. Csatai, and L. Nemedi.
Budapesti Kozegeszsegugy, Vol. 65, No. 2, p 49-51, 1978. 5 tab, 14 ref.

Descriptors: *Activated sludge, *Air pollution, *Clostridium, *Streptococcus, *Pseudomonas, Treatment facilities, Salmonella, E. coli, Movement, Wind, Aerobic bacteria, Sewage bacteria, Waste water treatment, Pollutant identification, Municipal wastes.

The emission of airborne microorganisms was measured at two activated sludge waste water treatment plants in Budapest, Hungary. Aerosol samples were taken by the sedimentation method at several distances from the plants. The number of bacteria growing in cultures at 20C was found to be 5,000,000/ml; at 37C, the bacteria count was 2,000,000/ml. Occurrences of specific bacteria identified included: a Clostridium count of 3,000/40 ml, fecal coliform of 3,000,000/100 ml. Tests for Salmonella were positive for 70-100% of the 100 ml samples. The maximum distance from the treatment plants at which microorganisms were found increased with increasing wind speed. At a wind velocity of 7 m/sec, E. coli was detected at distances of up to 20 m, Staphylococcus aureus and Klebsiella at up to 5 m, and Pseudomonas aeruginosa at up to 10 m from the treatment plant. The results of the study implied that the air space above biological waste water treatment plants may be a potential source of bacterial infection. (Takacs-FIRL)
W78-11822

OZONATION IN A WASTEWATER REUSE SYSTEM: EXAMINATION OF PRODUCTS FORMED,
Cincinnati Univ., OH. Environmental Health Engineering.
For primary bibliographic entry see Field 5D.
W78-11828

BIOCHEMICAL OXYGEN DEMAND PROGRESSION IN MIXED SUBSTRATES,
California Univ., Davis. Dept. of Civil Engineering.
J. P. Parisod, and E. D. Schroeder.
Journal Water Pollution Control Federation, Vol. 50, No. 7, p 1827-1834, July, 1978. 6 fig, 4 tab, 13 ref.

Descriptors: *Biochemical oxygen demand, *Respiration, *Analytical techniques, *Forecasting, *Measurement, Solubility, Organic loading, Acids, Activated sludge, Bacteria, Model studies, Waste water treatment, Municipal wastes.

The kinetics and the plateau BOD values for mixed substrate systems were analyzed with glucose, glutamic acid, succinate acid, and sorbitol and the existence of stoichiomtric end points for substrate conversion reactions was investigated. Plateau BOD valus were obtained for individual and mixtures of soluble substrates seeded with bacteria from primary sedimentation tank effluent or from activated sludge reactors; a Gilson differential respirometer was employed to measure oxygen uptake. The net cell growth in the substrates was calculated by subtracting the initial cell mass concentration from the plateau cell mass concentration. Single substrate plateau values obtained in these experiments correlated closely with previously reported values. In 34 mixed substrate plateau tests, the maximum variation between predicted and actual plateau values was 10.1%; the standard deviation was 4.0%. The study concluded that the calculation of ultimate BOD from the sum of the plateau BOD and the theoretical BOD of the cells produced up to the plateau was a feasible and valid technique. (Lisk-FIRL).
W78-11833

BIOASSAYS-PROCEDURES AND RESULTS,
Research Triangle Inst., Research Triangle Park, NC.
L. W. Little.
Journal Water Pollution Control Federation, Vol. 50, No. 7, p 1852-1868, July, 1978. 179 ref.

Descriptors: *Bioassay, *Bioindicators, *Chemical analysis, *Reviews, Publications, Analytical techniques, *Pollutant identification, Soil analysis, Water analysis, Algae, Fish, Invertebrates, Trophic level, *Bibliographies.

Literature on bioassay procedures and their applications to a variety of aquatic flora and fauna was reviewed. The design and interpretation of bioassay testing has been applied to individual chemicals and metals in laboratory procedures; in-depth studies have examined the impact of naturally occurring complex chemical compounds on bioindicators. Experimental equipment has been designed to closely simulate conditions in water bodies and soils; structures have been improved to provide realistic dosing procedures, to maintain proper oxygen concentrations, to quantify microbial populations, and to record patterns of movement. The results of bioassay procedures were reviewed for microorganisms , algae, invertebrates, and fish; results of comparative testing with several trophic levels and the effect of the health status of the test organisms on the results of bioassay interpretations were also examined. (Lisk-FIRL)
W78-11834

A NOMOGRAM FOR THE DETERMINATION OF AMMONIA IN WASTEWATER BY A KNOWN ADDITION TECHNIQUE,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Applied Chemistry Labs.
S. Y. Ip, and N. H. Pilkington.
Journal Water Pollution Control Federation, Vol. 50, No. 7, p 1869-1870, July, 1978. 4 ref.

Descriptors: *Analytical techniques, *Graphical analysis, *Ammonia, *Chemical analysis, *Electrodes, Sodium compounds, Equations, Mathematical models, Aqueous solutions, Pollutant identification, Water analysis, Waste water treatment, Municipal wastes.

A nomogram incorporating a known addition technique is presented for calculating the concentration of NH3-N in waste water. The technique is designed to compensate for random drifts in the calibration lines of an ammonia gas sensing electrode. A 1,000 mg/liter NH3-N solution is prepared by adding 3.819 g of NH4Cl to one liter of water, followed by dilutions to 1, 5, 10, 25, 50, and 100 mg/liter. To a 100 ml 10M NaOG; the initial electrode potential is then calculated as a function of the electrode slope and the solution concentration. The Nernstian slope is calculated from a semi-log plot of the millivolts in relation to a series of standard NH3-N solutions. A 2.0 ml sample of a 1,000 mg/liter NH3-N solution is added to the sample and the new equilibrium potential of the electrode is calculated to provide the change in electrode potential. The decrease in potential is then calculated as a function of the electrode slope and the various solution concentrations and volume. The nomogram is developed by aligning the Nernstian slope with the decrease in electrode potential; the concentration of NH3-N is then calculated by extrapolating the line to the intersection with the NH3-N concentration axis. (Lisk-FIRL)
W78-11835

DIRECT ANALYTICAL PROCEDURE FOR DETERMINATION OF VOLATILE ORGANIC ACIDS IN RAW MUNICIPAL WASTEWATER,
Technion-Israel Inst. of Tech., Haifa. Environmental Engineering Lab.
N. Narkis, and S. Henfeld-Furie.
Water Research, Vol. 12, No. 7, p 437-446, 1978. 15 fig, 3 tab, 22 ref.

Descriptors: *Organic acids, *Analytical techniques, *Gas chromatography, *Acidity, *Columns, Volatility, Centrifugation, Chemical analysis, Instrumentation, Phosphorus compounds, Waste water treatment, Water analysis, Municipal wastes.

A technique for analyzing volatile organic acids in raw or chemically treated sewage permits direct injection of the sewage sample into a gas chromatograph without extensive pretreatment. Less than 1 g of crystallized metaphosphoric acid is added to a 10 ml sample of raw sewage to adjust the pH to 2-3. The mixture is then centrifuged at 14,000 rpm for 20 min at 5C to remove suspended solids and proteins; the sample is injected directly into a gas chromatography equipped with a hydrogen flame ionization detector. An 8 ft glass column with a 0.125 inch diametcr is packed with 60-80 mesh Chromosorb W which has been washed with phosphoric acid and coated with 20% Carbowax 20 M dissolved in chloroform; the packing is washed again after vacuum drying with 3% H3PO4. Acetic and propionic acid analysis requires 5-10 microliter samples; 20-40 microliter samples are used for analysis of butyric, isovaleric, valeric, and hexanoic acids. The appearance of volatile acids after 4-7 min of retention follows the order: acetic, propionic, isobutyric, butyric, isovaleric, valeric, and hexanoic acid; formic acid is not detectable by flame ionization. The gas chromatography direct injection technique can detect and quantify 70.0-97.5% of the volatile acids identified according to standard methods. (Lisk-FIRL)
W78-11836

THE OCCURRENCE OF AEROMONADS IN ACTIVATED SLUDGE: ISOLATION OF AEROMONAS SOBRIA AND ITS POSSIBLE CONFUSION WITH ESCHERICHIA COLI,
Swedish Water and Air Pollution Research Lab., Stockholm.
A. H. Neilson.
Journal of Applied Bacteriology, Vol. 44, No. 2, p 259-264, 1978. 1 tab, 26 ref.

Descriptors: *Aerobic bacteria, *Analytical techniques, *Isolation, *Acid bacteria, *Activated sludge, Antibiotics(Pesticides), Viricides, Cultures, Biological properties, Chemical analysis, Sewage bacteria, Nitrogen fixing bacteria, E. coli, Waste water treatment, Municipal wastes.

Strains of Aeromonas sobria, isolated from activated sludge, paper mill effluent, and biologically-treated food processing effluent, exhibited characteristics very similar to E. coli when analyzed according to standard methods. Between 100,000 and 10,000,000 aeromonads/g wet weight were isolated on Endo Agar, Tergitol-7 Agar, galactitol peptone agar, Shotts and Rinler medium, and analine blue agar. All of the isolated populations produced acid in stabs of triple sugar iron medium but demonstrated weak or negligible oxidase activity in freshly isolated strains. A. sobria produced gas more readily from lactose and formed metallic colonies on Endo and EMB agars; A. hyydrophila more readily hydrolyzed aesculin, formed acid from arabinose and salicin, and exhibited aerobic growth in arabinose, L-histidine, and L-arginine. None of the isolates produced gas from lactose in EC medium at 44.5C. About 95% of the strains were resistant to ampicillin and sensitive to gentamycin; al were resistant to penicillin and sensitive to tetracycline and chloramphenicol. None of the strains exhibited nitrogenase activity comparable to the nitrogen-fixing capacity of Enterobacteriaceae. Other characteristis distinguishing A. sobria strains from E. coli included positive DNase, lipase, gelatinase, and arginine decarboxylase activities. The strains are unable to produce acid from xylose and arabinose or grow in L-glutamate; about 67% of all strains were beta-hemolytic. (Lisk-FIRL)
W78-11838

DEVELOPMENT OF QUANTITATIVE METHODS FOR THE DETECTION OF ENTEROVIRUSES IN SEWAGE SLUDGES DURING ACTIVATION AND FOLLOWING LAND DISPOSAL,
Baylor Coll. of Medicine, TX. Dept. of Virology and Epidemiology.
C. J. Hurst, S. R. Farrah, C. P. Gerba, and J. L. Melnick.
Applied and Environmental Microbiology, Vol. 36, No. 1, p 81-89, July, 1978. 3 fig, 9 tab, 16 ref.

Descriptors: *Viruses, *Analytical techniques, *Activated sludge, *Alkalinity, *Adsorption, Centrifugation, Filtration, Application methods, Sludge disposal, Disinfection, Waste water treatment, Human diseases, Municipal wastes.

Enteroviruses were eluted from sewage sludge by : suspension of the solids in o.05 M glycine buffer at pH 11.5 M glycine buffer at pH 2.0 to form organic flocs; filtration through 3.0, 0.45, and 0.25 miron filters; and elution for bioassay. The described procedure recovered about 80% of poliovirus tupe 1, 68% of echovirus type 7, and 75% of coxsackievirus B3 from seeded activated sludge. The technique required about 3 hrs to complete and recoverd more viruses than elution with 3% beef extract and sonification. analysis of activated sludge after land application concluded that a linear semilogrithmic relationship exists between viral inactivation and duration on land. After 7 days of drying in the field, 0.5-3.0% of the viruses were recovered from the sludge; no viuruses were apparent in the sludge 3 mos after land application. Sludge solis content increased up to 30 days, levelled at about 65% solids, and subsequently decreased; a direct correlation was observed between moiture loss in the sludge and viral inactivation. (Lisk-FIRL)
W78-11839

A MORE ECONOMICAL METHOD FOR THE DETERMINATION OF CHEMICAL OXYGEN DEMAND,
Canada Centre for Inland Waters, Burlington (Ontario).
J. R. Knechtel.
Water Pollution Control, Vol. 116, No. 5, p 25-29, May-June, 1978. 1 fig, 5 tab, 9 ref.

Descriptors: *Chemical oxygen demand, *Analytical technique, *Chemical analysis, *Spectrophotometry, *Digestion, Absorption, Catalysts, Chemical reactions, Laboratory equipment, Laboratory tests, Chemical properties, Waste water treatment, Municipal wastes.

An alternative technique for COD analysis of waste water, employing spectrophotometric measurement, utilizes smaller sample and reagent volumes. A 10 ml waste water sample, standard, or blank solution is placed in a screw cap culture tube which is of a size suitable for direct placement in the adapter of the spectrometer. The sample is mixed with 6 ml of a digestion solution; the digestion solution is prepared by mixing 167 ml concentrated sulfuric acid, 500 ml distilled water, 17.0 g mercuric sulfate, and 10.216 g potassium dichromate; cooling the mixture; and diluting it to 1.00 liter. A 14 ml aliquot of catalyst solution, prepared by mixing 22 g of reagent grade silver sulfate in a 19.8 kg bottle of concentrated sulfuric acid, is added to the sample. The solution is digested for two hours with the teflon-lined bakelite cap closed at 150C in a forced-air oven. After the aliquot has cooled, absorbance is measured at 600 nm; the blank is adjusted to 100% transmittance and the sample optical densities are plotted against COD to form a calibration curve. Value of tests using the described procedure have been slightly higher than those obtained by standard COD techniques; this difference is attributed to more complete digestion and retention of volatile matter in the culture tube. The detection limit of the test is reported to be double the optical density variation at the blank level; samples containing more than 1,000 mg/liter COD must be diluted before testing. (Lisk-FIRL).
W78-11840

REGULAR TESTING CAN CONTROL HYDROGEN SULFIDE,
FMC Corp., San Jose, CA.
E. J. Keating.
Water and Sewage Works, Vol. 125, No. 7, p 68-70, July 1978. 3 fig, 1 tab.

Descriptors: *Analytical techniques, *Hydrogen sulfide, *Sulfides, *Sewers, *Odor, Corrosion control, Colorimetry, Volumetic analysis, Titanium, Oxidation, Toxicity, Acidity, Waste water treatment, Municipal wastes.

Procedures to quantify and control hydrogen sulfide in waste water can reduce the gas's potential toxic effect on treatment plant workers and alleviate sewer corrosion from sulfuric acid generation. Monitoring the pH of the waste water is important in calculating the amount of dissolved sulfide present as hydrogen sulfide, associated with the odor and corrosion problems, or as hydrosulfide ions; hydroen sulfide predominates in acidic wastes and equals the quantity of hydrosulfide ions at pH 7. The methylene blue colorimetric test, with a detection limit of 20 mg sulfide/liter, has several variations: the titrimetric iodine test for oxidizing sulfides to sulfur; the LaMitte-Pomeroy test with dual test tube analysis; the Hach Alka-Seltzer technique which effervesces hydrogen sulfide onto a chemically treated disc; and gas detector tubes. A T-I-Y Kit developed by FMC Corp. can be used for analysis when hydrogen peroxide is used to control hydrogen sulfide. Hydrogen peroxide may be detected with titanium sulfate or test strips. A laboratory analysis of three waste water samples, untreated, treated with a small quantity of H202, and treated with a larger H202 dose, provides data on the optimum H202 dosage

to control sulfide in waste water. From this information, field tests can be conducted at problem sites to determine specifc treatment needs. (Lisk-FIRL).
W78-11841

ANTIBIOTIC RESISTANCE PATTERN OF SALMONELLA WELTEVERDEN STRAINS ISOLATED FROM MAN, ANIMALS, SEWAGE AND WATER,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Coll. of Veterinary Medicine.
K. N. Upadhyay, and D. S. Misra.
Indian Journal of Medical Research, Vol. 67, p 212-216, February, 1978. 2 tab, 9 ref.

Descriptors: *Salmonella, *Antibiotics(Pesticides), *Bactericides, *Resistance, *Diseases, Sewage, Human diseases, Animal diseases, Analytical techniques, Isolation, Waste water treatment, Municipal wastes.

Strains of Salmonella welteverden isolated from humans, animals, sewage, and water were examined for resistance or sensitivity to antibiotics. Of the 127 strains isolated, all were completely resistant to bacitracin and erythromycin. Strains isolated from humans exhibited resistance to eight other antibiotics, including: sulfathiozole, viomycin, polymyxin B, nalidixic acid, tetracycline, oxytetracycline, chlortetracycline and kanamycin; human isolates were the only strains resistant to the three latter antibiotics. The higher resistance of human strains was attributed to the frequent medical use of antibiotics. Animal strains were resistant to four antibiotics while sewage isolated strains were resistant to three. Minimum inhibitory concentration (MIC) levels of 60 strains against polymyxin B sulfate, tetracycline, and chloramphenicol were high for human strains exposed to tetracycline and chloramphenicol and high for sewage strains in contact with polymyxin B sulfate. Low MIC level sensitive strains from humans were recorded for polymyxin B and tetracycline. Low MIC level sensitivity to chloramphenicol was absent in human strains but present in animal and sewage strains. (Lisk-FIRL).
W78-11842

DETERMINATION OF ORGANOSILICONE IN SEWAGE SLUDGE BY ATOMIC ABSORPTION SPECTROMETRY, (IN JAPANESE).
Ajinomoto Co., Inc., Kanagawa (Japan). Central Research Labs.
Y. Tsuchitani, K. Harada, K. Saito, N. Muramatsu, and K. Uematsu.
Buseki Kagaku, Vol 27, No 6, p 343-347, 1978. 4 fig, 6 tab, 6 ref.

Descriptors: *Organic wastes, *Analytical techniques, *Absorption, *Separation techniques, *Sewage sludge, Solvent extractions, Activated carbon, Dehydration, Vacuum drying, Spectrometry, Spectroscopy, Chromatography, Waste water treatment, Municipal wastes.

Organosilicone was separated from sewage sludge by solvent extraction, dehydration, and activated carbon filtration before analysis by atomic absorption spectrometry. A 10-20 g sample of sludge was neutralized to pH 6-7 and placed in an extraction apparatus with 100-150 ml of toluene. The sludge was azeotropically dehydrated; the organosilicone was extracted in 70-100 ml of toluene. After vacuum evaporation of the toluene, the organosilicone-bearing residue was dissolved in methyl isobutyl ketone; the solution was filtered through an activated carbon column and concentrated to 20 ml. The organosilicone concentration was determined by atomic absorption spectrometry at 251.6 nm; the oil was primarily in the form of dimethylpolysiloxane. The extraction process recovered about 88% of the organosilicone at a variance coefficient of 12%. The technique was considered more practical than liquid-liquid extraction by a separation funnel or extraction by a Soxleht unit; results of the atomic absorption spectrometry analysis were comparable to those of proton nuclear magnetic resonance or gel permeation chromatography. (Lisk-FIRL)
W78-11844

TOXICITY-TEST ON FISH CARASSIUS AURATUS IN WATERS AND SEWAGES CONTAINING PHENOL, TREATED WITH NACLO OR WITH CLO2 (IL TEST DI ITTIOTOSSICITA' SU ACQUE E LIQUAMI DEPURATI CON IPOCLORITO E BIOSSIDO DI CLORO, IN PRESENZA DI FENOLO),
Naples Univ. (Italy). Dept. of Hygiene and Science.
A. Paoletti, A. Parrella, F. Aliberti, and E. Gargiulo.
Igiene Moderna, Vol 71, No 1, p 86-116, 1978. 8 fig, 3 tab, 27 ref.

Descriptors: *Phenols, *Chlorination, *Potable water, *Sewage effluents, *Oxidation, Toxicity, Coliforms, Lethal limit, Mortality, Fish, Disinfection, Biochemical oxygen demand, Chemical oxygen demand, Waste water treatment, Water treatment, Municipal wastes.

Goldfish (Carassius auratus) were used in 50% median mortality (TLM50) tests performed on phenolated sewage and potable water disinfected with chlorine dioxide or sodium hypochlorite. Samples of phenol-bearing spring, mineral, and tap water were treated with 40 ppm of ClO2 or NaClO for a contact time of 30 min; oxidized waste water, containing 30-70 ppm BOD, 60-95 ppm COD, and 400,000-700,000 coliforms/100 ml, and graywater having 95-280 ppm BOD, 280-400 ppm COD, and 8,000,000-50,000,000 coliforms/100 ml were similarly treated. The potable and sewage waters acquired a 'secondary induced toxicity' after treatment with either disinfectant; phenolated potable water was more toxic than sewage wastes after treatment. The greater toxicity of the disinfected potable waters was attributed to the lack of organic matter, especially fecal coliforms, to consume the chlorinated phenolic compounds. The TLM50 for goldfish sustained in mineral, spring, and tap water treated with NaClO ranged over 1.22-2.92 hrs; in water treated with ClO2, the TLM5O covered 2.85-4.85 hrs. The TLM5O of oxidized waste water was 7.35 hrs after NaClO treatment and 9.05 hrs after ClO2 disinfection; graywater yield TLM5O values of 7.16 hrs and 8.46 hrs after treatment with NaClO and ClO2, respectively. Graywater was more toxic to fish before disinfection; untreated phenolated tap water was more toxic to fish than the other potable waters tested. (Lisk-FIRL)
W78-11845

SIGN-OF-CHARGE OF SPECIES OF CU, CD AND ZN EXTRACTED FROM SEWAGE SLUDGE, AND EFFECT OF PLANTS,
Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
J. V. Lagerwerff, and R. P. Milberg.
Plant and Soil, Vol 49, No 1, p 117-125, 1978. 2 fig, 2 tab, 18 ref.

Descriptors: *Heavy metals, *Cations, *Anions, *Sewage sludge, *Resins, Soybeans, Copper, Zinc, Cadmium, Moisture content, Separation techniques, Analytical techniques, Chelation, Leachate, Municipal wastes.

Laboratory studies measured the sign of charge and the concentration of Cu, Cd, and Zr leached from moist or air-dried 5-yr-old sewage sludge passed through columns bearing cationic, anionic, or mixed resins; the sewage sludge had been obtained from the Black River waste water treatment plant in Baltimore, Maryland. The sludge had an initial moisture content of 38.4% which was reduced to 1.9% by air drying. Aliquots of sludge, extracted by equilibration, were adjusted to pH 3.2, 5.2, and 6.6 before filtration through the resins. For air-dried sludge, the Cd extract yielded 87% cationic species; the Cu extract contained 16% cationic and 72% amphoteric species. Moist storage extracts contained 83% amphoteric Cd, 50% cationic Cu, and 30% amphoteric Cu. Increasing the pH of the extracts caused an increase in neutral and anionic Cu species. Zn extracts, regardless of storage conditions, yielded 84-92% cationic species. The Cu uptake from sludge extracts by plants was analyzed by growing soybean seedlings for 48 hrs in aqueous extracts of Cu-enriched sludge. Extracts sampled after the growth period demonstrated that 68% of the amphoteric, 55% of cationic, 83% of anionic, and 100% of neutral Cu species remained in the extract. (Lisk-FIRL)
W78-11846

H2-PRODUCING BACTERIA IN DIGESTING SEWAGE SLUDGE ISOLATED ON SIMPLE, DEFINED MEDIA,
North Dakota State Univ., Fargo. Dept. of Bacteriology.
P. Holmes, and M. R. Freischel.
Applied and Environmental Microbiology, Vol 36, No 2, p 394-395, August, 1978. 2 tab, 10 ref.

Descriptors: *Enteric bacteria, *Hydrogen, *Sludge digestion, *Carbohydrates, *Cultures, Analytical techniques, Sewage bacteria, Anaerobic bacteria, Nutrient requirements, Iron, Selenium, Methane, Waste water treatment, Anaerobic digestion, Municipal wastes.

Five genera of H2-producing Enterobacteriaceae were isolated from digested sewage sludge on a modified anaerobic basal salts medium, supplemented with various carbohydrate substrates. The basal salts medium received additions of 0.0000001 M sodium selenite, 4 mg/liter ferrous chloride, a vitamin mixture, 1.5% wt/vol agar, and one of the test substrates. The supplemental substrates included: glucose, fructose, sucrose, maltose, cellobiose, glutamate, histidine, glycine, serine, threonine, stearic and oleic acids, phenol, nicotine, tryptophan, benzoate, and olive oil. Glucose yielded the highest number of H2-producing isolates; carbohydrate substrates produced more H2-producing bacteria than non-carbohydrate media. About 69% of the isolates recovered on glucose were H2-producing species; 58% of the isolated Enterobacteriaceae were identified as Citrobacter, 28% as Enterobacter, 0.3% as Escherichia, and 13% as two unidentified genera. Of all the H2-generating bacteria produced, 85% were isolated on glucose and consisted of 65% Citrobacter and 25% Enterobacter; about 2% of the isolates were found on non-carbohydrate media. The average H2-producing bacterial count in digested sewage sludge was about 14,000,000/ml sludge; it was concluded that H2-producing Enterobacteriaceae contribute in some way to the eventual production of methane. (Lisk-FIKL)
W78-11847

A RAPID AUTOMATED SYSTEM FOR THE ANALYSIS OF DISSOLVED TOTAL ORGANIC NITROGEN IN AQUEOUS SOLUTIONS,
Michigan Univ., Ann Arbor. Environmental Chemistry Lab.
J. H. Lowry, and K. H. Mancy.
Water Research, Vol 12, No 7, p 471-475, 1978. 1 fig, 6 tab, 7 ref.

Descriptors: *Chemical analysis, *Nitrogen, *Automation, *Equipment, Monitoring, Sampling, Surveys, Irradiation, Ultraviolet radiation, Chemistry, Water chemistry, Aqueous solutions, Nitrogen compounds, Inorganic compounds, Organic compounds, Analytical techniques.

An automated system for the analysis of dissolved organic nitrogen was developed and applied to natural was developed and applied to natural waters. It was based on subjecting sample to ul-

traviolet irradiation followed by a heterogeneous reduction of the nitrogen containing irradiation products to ammonia which is detected by an ammonia gas sensing probe. Quantitative recoveries of different organic nitrogen compounds common to natural waters were obtained after 17 min of irradiation. Determination with and without irradiation makes possible the separate determination of total and inorganic nitrogen, respectively. (Sims-ISWS)
W78-11885

LIGNIN OF EFFLUENTS FROM THE SEGEZHA PULP AND PAPER MILL IN NATURAL RESERVOIRS (LIGNIN STOCHNYKH VOD SEGEZHSKOGO TSBK V PRIRODNOM VODOEME),
Adademiya Nauk SSSR, Petrozavodsk. Inst. Lesa.
For primary bibliographic entry see Field 5B.
W78-11912

CHARACTERIZATION OF DISPERSED RESIDUAL SOLIDS IN BIOLOGICALLY TREATED PULP AND PAPER MILL EFFLUENTS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W78-11913

AN INVESTIGATION OF THE EXTENT OF RESIDUAL BIOSOLIDS DEPOSITION IN QUIESCENT RECEIVING WATERS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5C.
W78-11914

A TEST AND A TECHNIQUE FOR PREDICTING FIVE DAY BOD VALUES OF KRAFT MILL WASTE,
Federal paper Board Co., Riegelwood, NC.
T. B. Douglas.
Tappi, Vol. 61, No. 4, p 53-56, April, 1978. 4 fig, 24 ref, 1 tab.

Descriptors: *Pulp wastes, *Biochemical oxygen demand, Testing procedures, Wastes, Industrial wastes, Pulp and paper industry, Chemical oxygen demand, Chemical analysis, Dissolved oxygen, Temperature, Hydrogen ion concentration, Toxicity, Testing, Kraft mills, Effluents, Water pollution sources, Water analysis.

Studies carried out at Federal Paper Board Co. (Riegelwood, North Carolina) show that a COD test for treated kraft mill effluents using NaOI (as opposed to permanganic and dichromic acids) closely approaches the oxidative power of microorganisms in the 5-day BOD test. Used in conjunction with described techniques of calculation and daily plots, this predictive BOD (PBOD) test has made possible accuate forecasts of 5-day BOD for over 4 years. Incubation of a solution containing 500 ml effluent, 50 ml of 0.1 normal iodine, and 1 ml of 50% NaOH for 1 hr at 20C and pH 12 or more gave a correlation coefficient of 0.953 and a standard deviation of 9.56 ppm in the ragne of 9-100 ppm for the PBOD test as compaed with the standard 5-day BOD values. The test is sensitive to temperature and pH changes. Further studies are needed to determine the effects on PBOD of materials which have a toxic effect on 5-day BOD tests, e.g., turpentine. (Switchenberg-IPC)
W78-11920

CONTROL OF HYDROGEN SULFIDE AND METHYL MERCAPTAN CONTENT IN WASTE WATERS AND CONDENSATES (KONTROL'ZA SODERZHANIEM SEROVODORODA I METILMERKAPTANA V STOCHNYKH VODAKH I KONDENSATAKH),
Kotlasskii Tsellyulozno-Bumazhnyi Kombinat (USSR).
H. V. Balakshina, R. I. Kishik, T. M. Vasil'eva, and K. I. Vlasova.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No. 22, p 5, August, 1977. 2 tab.

Descriptors: *Pulp wastes, *Condensates, *Hydrogen sulfide, *Methyl mercaptan, *Pollutant identification, Waste identification, Volumetric analysis, Aeration, Wastes, Industrial wastes, Water pollution sources, Foreign countries, Chemical analysis, Effluents, Pulp and paper industry, Soviet Union(USSR).

Kraft pulp mill effluents and condensates of the Kotlas pulp and paper Mill (USSR) were analyzed by aeration and two instrumental titration methods. Hydrogen sulfide cocnetnrations determined by potentiometric titration (with a silver ammoniate solution, pH 13-14) and by high-frequency titration (at pH 4) deviated from each other by not more than 5%. These instrumental metods proved superior to aeration which showed consistently lower values of hydrogen sulfide and methyl mercaptan due to the loss of sulfur compounds duringcompounds analysis. In addition the titration methods take 30 min (with an automated setup only 5 min) while aeration requires at least 1.5 hr. (DuVall-IPC)
W78-11922

RAPID METHOD FOR DETERMINING FIVE-DAY BOD (EKSPRESSMETOD OPREDELENIYA BPK5),
Kotlasskii Tsellyulozno-Bumazhnyi Kombinat (USSR).
G. N. Zimina, and G. M. Zaleshina.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No. 23, p 4, August, 1977. 1 fig.

Descriptors: *Waste identification, *Biochemical oxygen demand, Pollutant identification, Wastes, Industrial wastes, Water pollution sources, Oxidation, Optical properties, Biological properties, Liquid wastes, Chemical analysis, Water analysis.

The method described involves oxidation of a sample of liquid waste during heating in the presence of a mixture of strong acids and subsequent determination of optical density of the solution. A calibration curve depicting the relationship of optical density to 5-day BOD is given. A particular feature of the analysis is that not more than 20 ml of waste water sample is used. The same is boiled in a 150 mlflat-bottom flask with a reflux condenser for 1 hr. It is then cooled 30 min and filtered. Optical density is determined at 597 nm. The amount of acid added depends on the determined amount of BOD. For BOD values of 200-600 mg oxygen/liter the method uses about 200 ml of potassium dichromate plus 1800 ml of concentrated sulfuric acid and 10 g of silver sulfate. For BOD of 5-40 mg oxygen/liter the chemicals consumed include 20 ml of potassium dichromate plus 1800 ml of concentrated sulfuric acid, 180 ml of water, and 5 g of silver sulfate. (DuVall-IPC)
W78-11923

ANALYSIS OF LIGNIN IN BLACK LIQUOR AND WASTE WATERS (OPREDELENIE LIGNINA V CHERNYKH I STOCHNYKH VODAKH),
Vsesoyuznyi Nauchnyi Planovii Otdel Bumazhnoi Promyshlennost, Moscow (USSR).
L. A. Semakova, A. A. Sokolova, and D. P. Moseeva.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No. 24, p 10-11, August, 1977. 2 tab.

Descriptors: *Pulp wastes, *Black liquor, *Lignins, *Pollutant identification, Wastes, Industrial wastes, Water pollution sources, Spectrophotometry, Analytical techniques, Chemical analysis, Pulp and paper industry, Effluents, Organic compounds.

Ultraviolet spctrohotometry and anode voltamperometer (AVA) method, and Klason's sulfuric acid method (a modification of Komarov's method) are evaluated as to their ability to determine the lignin content in kraft black liquor and other pulp mill effluents. Ultraviolet spectrophotometry most accruately measures lignin content, because it accounts for the total lignin content as well as degradtion products and the effects f resinous materials, whereas in the AVA method all volatile materials are eliminated from the sample. Using UV spectrophotometery, the lignin content is determined from the concentration of resinous materials, their unit absorpting at 280 nm, and a correction factor. This is a simple sensitive method that requires 5-10 min. Results of the sulfuric acid method are lower than those of UV spectrophotometry, because they do not account for lignin in acidic solution, in the filtrate after the extraction of the precipitate, or in the hydrolyzate after hydrolysis. A combination of Komarov's sulfuric acid and UV spectrophotometry method does account for total lignin and is recommended for most accurate lignin content determination. (DuVall-IPC).
W78-11924

APPLICATION OF AUTOMATED ANALYSIS IN THE ESTIMATION OF SULFITE WASTE LIQUOR CONCENTRATION IN WATERS,
Washington Univ., Seattle. Dept. of Ecology.
R. G. Orquiola.
Water quality report, Vol. 74-20, 26 p, 1974. 5 fig, 15 ref, 4 tab.

Descriptors: *Sulfite liquors, *Waste identification, *Analytical techniques, Wastes, Industrial waste, Pulp wastes, Water pollution sources, Pulp and paper industry, Effluents, Lignins, Water analysis, Spent sulfite liquor.

The automated procedure described is based on the original Pearl-Benson method of estimating the concentration of lignosulfonates in water; cf. Paper Trade Journal, Vol. 111, No. 18, p 35-36 (October 31, 1940). The Auto Analyzer II two-channel system used in this investigation is capable of analyzing 40 spent sulfite liquor samples/hr compared with 12/hr compared with 12/hr by the originial method. Results obtained with this automated procedure are in agreement with those from the original method. (Witt-IPC).
W78-11931

VACUUM OPERATED SAMPLER,
H. D. Brailsford.
U.S. Patent No. 4,077,263, 5 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 968, no 1, p 74, March 7, 1978.

Descriptors: *Patents, *Water pollution, *Sampling, *Water sampling, On-site investigations, On-site data collection, Equipment.

A vacuum pump controlled by a timer periodically evacuates a metering chamber to draw water samples into the chamber from a source. A switch is actuated when the water level reaches a predetermined point and causes the motor to stop. An electrically controlled valve is connected to the metering chamber above the level of the intake nozzle of the pump and is closed when the pump is operating and open when the pump is stopped, thereby allowing air to enter the upper part of the chamber to relieve the vacuum and allow the metered sample to flow out through an outlet tube to a sample receptable. The outlet tube is controlled by a vacuum opeating pinch valve to be closed during sample intake so that the pump will not have to evacuate the sample container before starting to draw into the metering chamber. (Sinha - OEIS)
W78-11935

AQUATIC PESTICIDAL COMPOSITIONS AND METHOD,
Sandoz Ltd., Basel (Switzerland). (Assignee).
J. C. Harvey.
U.S. Patent No. 4,080,191, 6 p, 2 ref; Official Gazette of the United States Patent Office, Vol 968, No 3, p 1065, March 21, 1978.

Descriptors: *Patents, *Pesticides, Insect control, Aquatic weed control, Films, Thin films, Channels.

Pesticidal formulations suitable for combating insects or undesired plant growth in a water locus is described. The presence of aquatic weeds in waters such as rivers, canals, lakes and drainage channels present serious problems in view of obstructed water flow. Many insects at some stage of their development e.g. the larval stage, live on or directly beneath the water surface. The combating of such pests residing on or directly beneath the water surface poses serious difficulties. This invention provides a pesticidal 'slick' formulation which comprises 5 to 60% by weight of a pesticidal agent, 0.2 to 4% by weight of an anionic or non-ionic surfactant having an HLB (Hydrophilic/lipophilic balance) value of less than 12.5, and the balance to 100% by weight being a water-immiscible solvent/diluent having a mean specific gravity of less than 1. The term 'slick' as used here is meant a film, evenly formed on the surface of water. The pesticidal formulation is adapted to distribute itself evenly over the surface of water as a film. The type of pesticide employed in the formulations can very within wide limits. (Sinha - OEIS)
W78-11950

THE MUSSEL WATCH,
Scripps Institution of Oceanography, La Jolla, CA.
E. D. Goldberg, V. T. Bowen, and J. W. Farrington.
Environmental Conservation, Vol 5, No 2, p 101-125, Summer 1978. 10 fig, 13 tab, 24 ref.

Descriptors: *Water pollution effects, *Bioindicators, *Pollutant identification, Monitoring, Mussels, Oil pollution, Outer Continental Shelf, Ocean pollution, Indicator species, Bivalves, 'Mussel Watch', Mytilus, Ostrea, Crassostrea.

The Mussel Watch concept involves surveillance of U.S. coastal regions for their pollutant contents utilizing species of mussels (Mytilus) and oysters (Ostrea or Crassostrea) as surveillance organisms. The programme was coordinated by the Scripps Institution of Oceanography under contract with the U.S. Environmental Protection Agency, the analysis being performed by five participating laboratories. The procedures for the monitoring programme were formulated by a guidance committee composed of the scientists whose facilities would be involved in the analytical work. A meeting of the Mussel Watch Guidance Committee, held at Block Island, RI, during 11-13 July 1977, evaluated the results of the first year and this provided a basis for formulating more effective tactics. Tactics to implement the following changes will be considered at the next meeting: (1) inclusion of sampling sites near areas of high pollutant discharge; (2) Mercury will be added to the list of heavy-metals analyzed; and (3) the number of Mytilus edulis and M. californianus collected from the same West Coast sites will be increased to establish more adequately than heretofore the species differences in bioaccumulation of the pollutants under study. (Sinha - OEIS)
W78-11957

QUANTITATION OF SULFUR CONTAINING OIL COMPOUNDS AND POLYCHLORINATED BIPHENYLS (PCB) IN MARINE SAMPLES,
Osaka Prefecture Inst. of Public Health (Japan). Lab. of Food Chemistry.
A. Nakamura, and T. Kashimoto.
Bull Environm Contam Toxicol, Vol 20, No 2, p 248-254, August 1978. 4 fig, 2 tab, 13 ref.

Descriptors: *Pollutant identification, *Oil spills, *Industrial wastes, *Water pollution, Sulfur, Gas chromatography, Polychlorinated biphenyls, Outer Continental Shelf, Ocean dumping.

Oil spillage by causal boat accidents and/or discharge from boats and industrial sewages presently cause world-wide contamination of coastal sea water, beach and biota in the marine environment. For the fingerprint of oil pollution, n-alkanes, polyaromatic hydrocarbons are widely used in marine biota, sediments and human tissues. The authors selected sulfur containing oil compounds pollution in marine products and reported contamination of sulfur compounds in oysters from the Seto Inland Sea. For the successive analyses of these compounds, gas chromatography on a capillary column and high pressure liquid chromatography (HPLC) technique were also reported. In this paper, levels of contamination of sulfur containing oil compound in shell fishes, other marine samples and sediments are determined by gas chromatography. The evaluation of Polychlorinated biphenyls (PCB) levels in the same samples are also presented. (Sinha-OEIS)
W78-11960

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 3A: SOUTHWEST FLORIDA - SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11974

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 3B: SOUTHWEST FLORIDA - GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11975

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 4: NORTHWEST FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11976

COMPARISON OF THE RADIOACTIVE AND MODIFIED TECHNIQUES FOR MEASUREMENT OF STREAM REAERATION COEFFICIENTS,
Geological Survey, Bay St. Louis, MS. Water Resources Div. and Geological Survey, Madison, WI. Water Resources Div.
R. E. Rathbun, and R. S. Grant.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 064, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-68, May 1978. 57 p, 23 fig, 12 tab, 22 ref.

Descriptors: *Reaeration, *Tracers, *Radioactivity techniques, *Streamflow, Measurement, Oxygenation, Dissolved oxygen, Water pollution, Analytical techniques, Evaluation, *Reaeration coefficient, *Nonradioactive tracers.

The radioactive and modified tracer techniques were used to measure the reaeration coefficients of two reaches each of Black Earth Creek and the Madison Effluent Channel near Madison, Wis. Coefficients measured with the modified technique were from -8.96 to +3.61 and from +15.7 to +32.2 percent different from the coefficient measured with the radioactive tracer technique on Black Earth Creek. The larger coefficients measured with the modified technique on the second reach were attributed to increased wind conditions during the latter part of the modified-technique experiment. Interpretation of the Madison Effluent Channel study was complicated by an unsteady flow condition during the modified-technique experiment which required estimation of the dye loss and the discharge increase. Using these estimated values, the coefficients measured with the modified technique were from +25.3 to +57.9 and from -4.74 to +2.94 percent different from the coefficient measured with the radioactive technique on the Madison Effluent Channel. Results of this study suggest that the modified technique is a promising alternative to the use of radioactive tracers. (Woodard-USGS)
W78-11977

CHEMISTRY OF WATERS IN THE GEOPRESSURED ZONE FROM COASTAL LOUISIANA -- IMPLICATIONS FOR THE GEOTHERMAL DEVELOPMENT,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2K.
W78-11980

WATER-QUALITY RECORDS FOR THE HUBBARD CREEK WATERSHED, TEXAS, OCTOBER 1974 - SEPTEMBER 1976,
Geological Survey, Austin, TX. Water Resources Div.
H. J. Davidson.
Open-file report 78-98, January 1978. 46 p, 2 fig, 10 tab, 8 ref.

Descriptors: *Water quality, *Watersheds(Basins), *Streams, *Reservoirs, *Discharge(Water), Water analysis, Chemical analysis, Water temperature, Hydrogen ion concentration, Sampling, Sites, Basic data collections, Texas, *Hubbard Creek watershed, Shackelford County, Stephens County.

This report presents a compilation of water-quality data for the Hubbard Creek watershed in Texas collected during October 1974 - September 1976. The tabulated data include discharge, chemical constituents, temperature, and pH. (Woodard-USGS)
W78-11981

SELECTED HYDROLOGIC DATA, CAMAS PRAIRIE, SOUTH-CENTRAL IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-11982

ELUTRIATOR/MICROCOSM SYSTEM PILOT MODEL AND TEST,
Naval Ocean Systems Center, Kailua, HI.
For primary bibliographic entry see Field 5C.
W78-12000

PROGRAM AND ABSTRACTS: SYMPOSIUM ON NONBIOLOGICAL TRANSPORT AND TRANSFORMATION OF POLLUTANTS ON LAND AND IN WATER.
National Bureau of Standards, Washington, DC.
For primary bibliographic entry see Field 5B.
W78-12015

SOURCES AND CHARACTERISTICS OF SOLUBLE ORGANIC NITROGEN IN ACTIVATED-SLUDGE EFFLUENTS,
Stanford Univ., CA.
G. F. Partin.
PhD Thesis, 1978. 258 p.

Descriptors: *Nitrogen, *Activated sludge, *Organic wastes, *Nutrient removal, *Amino

acids, Oxidation, Biological treatment, Biodegradation, Chemical oxygen demand, Activated carbon, Adsorption, Anion exchange, Cation exchange, Waste water treatment, Municipal wastes.

The sources and characteristics of soluble organic nitrogen (SON) in activated sludge effluents and raw sewage were investigated. From 20-50% of the biologically produced SON originates from excreted materials; another 20-50% results from organism decay, while a much smaller percentage is produced by substrate oxidation. About 20-40% of the SON is produced biologically during the activated sludge process. When operated with 6 hours of aeration and 4-10 days of solids retention, the activated sludge can reduce SON by 60-70% and soluble COD by 70-80%. SON concentrations of 0.2-0.8 mg/liter can result from semi-continuous operation; these concentrations increase to 1.5-5.0 mg/liter during start-up and system imbalance. SON consists of about 15-30% nucleic acid and 10% free or combined amino acids. About 50-60% of the effluent SON and soluble COD has a molecular weight below 1,800; higher molecular weights are observed in the excess SON produced during start-up. Activated carbon adsorption reduces SON by about 72% and soluble COD by about 78%. Cationic exchange at pH 2.0 reduced SON by 33-56%; at pH 9.5, anionic exchange reduces SON by about 10-24%. (Lisk-FIRL)
W78-12039

LEAST-SQUARES ESTIMATOR FOR POLLUTED STREAM VARIABLES IN A DISTRIBUTED PARAMETER MODEL,
Tampere Univ. of Tech. (Finland).
For primary bibliographic entry see Field 5B.
W78-12042

TRIHALOMETHANES AND VIRUSES IN A WATER SUPPLY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
R. C. Hoehn, C. W. Randall, F. A. Bell, Jr., and P. T. B. Shaffer.
Journal of the Environmental Engineering Division, Vol 103, No EE5, Proceedings of the American Society of Civil Engineers, p 803-814, October 1977. 5 fig, 5 tab, 12 ref.

Descriptors: *Halogens, *Organic compounds, *Water pollution, *Water supply, *Water treatment, *Viruses, Chlorination, Chloroform, Humic acids, Volatility.

In June 1975, a program was established for monitoring viruses and volatile organics in the Occoquan Reservoir and water service area supplying approximately 600,000 residents of northern Virgina. Of interest were: (1) the magnitude of and variations in total trihalomethanes (TTHM) during the year; and (2) whether viruses could be recovered. Discharges of chlorinated sewage did not appreciably alter TTHM concentrations in one of the reservoir tribuaries, but as others have shown, chlorination of water from the reservoir during routine treatment produced high TTHM concentrations, principally chloroform, in finished water. The highest concentrations were observed in summer when the finished water was approximately 275 micrograms/l. Polio l was recovered on seven occasions, four times from finished water. This report has stimulated much interest and has resulted in further monitoring to try to verify the reported findings and in a joint experimental project to test methods of virus sampling and analysis.
W78-12045

TWO-TEMPERATURE MEMBRANE FILTER METHOD FOR ENUMERATION OF FECAL COLIFORM BACTERIA FROM CHLORINATED EFFLUENTS,
Massachusetts Univ., Amherst.
B. L. Green.
pH D Thesis, 1978. 146 p.

Descriptors: *Coliforms, *Membrane processes, *Filtration, *Chlorination, *Analytical techniques, Incubation, Temperature, Laboratory tests, Sewage bacteria, Sewage treatment, Microbiology, Numerical analysis, Waste water treatment, Municipal wastes.

The incubation procedure required for the membrane filtration enumeration of fecal coliform bacteria in chlorinated effluents was modified to permit more accurate analysis. Incubation of chlorinated effluent samples at 44.5C prior to standard membrane filter enumeration of coliforms was found to critically affect the recovery of sublethally injured coliforms. Chlorinated primary and secondary effluents were preincubated at 35C for 5 hrs, followed by incubation for about 18 hrs at 44.5C, prior to membrane filtration of the effluents for coliform quantification. Results of the modified and standard methods were compared to those obtained by multiple-tube most probable number (MPN) procedures; the standard membrane filter technique recovered only 15% of the coliforms obtained by the MPN procedure. Th modified incubation technique yielded 68% of the fecal coliforms recovered by the MPN procedure. Correlation of results obtained from the modified technique and the MPN procedure was highest in tests with secondary effluents. (Lisk-FIRL)
W78-12052

ANALYSIS OF RUNOFF FROM SOUTHERN GREAT PLAINS FEEDLOTS,
Southwestern Great Plains Research Center, Bushland, TX.
For primary bibliographic entry see Field 5B.
W78-12075

METHODS FOR MEASURING THE ACUTE TOXICITY OF EFFLUENTS TO AQUATIC ORGANISMS,
Environmental Research Lab., Athens, GA.
W. Peltier.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 690, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA 600/4-78-012, 7 tab, 14 fig, 34 ref, append.

Descriptors: *Bioassay, Toxicity, Mortality, Fishes, Invertebrates, *Laboratory tests, *Laboratory equipment, Effluents, Sewage, *Methodology, Laboratory animals, Acute toxicity, Macroinvertebrates.

This report describes methods for the measurement of the acute toxicity of effluents to macroinvertebrates and fish. The methods include a preliminary short-term (8-24 hr.), range-finding test and a long-term (96 hr.), or alternate static definitive test for use in determining the LC50 or EC50 of the waste. The report includes guidelines on effluent sampling and holding, facilities and equipment, dilution water, test species selection and handling, and data interpretation. (EIS-Katz)
W78-12099

5B. Sources Of Pollution

GROUND-WATER QUALITY VARIATION IN PHELPS COUNTY, MISSOURI,
Forest Service (USDA), Rolla, Missouri, National Forests in Missouri.
C. P. Tryon.
Ground Water, V. 14, No. 4, p. 214-223, July-Aug., 1976. 10 fig., 2 tab., 17 ref.

Descriptors: *Groundwater quality, *Missouri, Nitrates, Coliforms, Wells, Fertilizers, *Agricultural runoff, Leaching, Sewage, Farm wastes, Pasture land.

Information from 675 water wells in and around Phelps County, Missouri shows that discrete areas of differing ground-water quality can be identified and mapped. The best quality groundwater, as judged by its low nitrate content and coliform bacteria density, is found in areas of relatively little agricultural (pasture and livestock) land use. The adverse effect of agricultural land use on groundwater quality is more severe in the intensely developed karst than in the less intensely developed. Rural population density and soil association variations have no readily discernible effects on ground-water quality. Nitrate concent varies seasonally and in response to rainfall, and decreases with increasing well depth. Coliform bacteria density is positively correlated with nitrate content. (East Central)
W78-11307

A MODEL FOR RUNOFF OF PESTICIDES FROM SMALL UPLAND WATERSHEDS,
Agricultural Research Service, Watkinsville, GA.
R. R. Bruce, L. A. Harper, R. A. Leonard, W. M. Snyder, and A. W. Thomas.
Journal of Environmental Quality, V. 4, p. 541-548, Oct.-Dec., 1975. 8 fig, 1 tab, 18 ref.

Descriptors: *Model studies, *Agricultural runoff, Erosion, Sediments, *Pesticides, Rainfall-runoff relationships, Water quality, Water Pollution sources.

A mathematical model was developed which describes the rate and quantity of runoff water from separate rainfall events on a watershed and the rate and quantity of sediment and pesticides transported. The experimental site used in the model testing was a 2.71-ha watershed in the upper Piedmont plain near Watkinsville, Georgia. instruments were installed to measure rainfall and surface runoff in addition to providing runoff samples for sdiment and chemical analysis. The watershed was planted to soybeans with rows roughly perpendicular to the main drainage channel. Trifluralin was applied before planting at a rate of 1.12 kg/ha and incorporated to a depth of approximately 7.5 cm. Diphenamid at 3.36 kg/ha, and paraquat at 11.2 kg/ha, were surface-applied at a rate 20 times the normal rate for weed control to serve as a tracer for strongly absorbed chemicals. The model was tested for 4 storms which occurred during summers of 1972 and 1973. These storms were short duration and were characterized by relatively high intensities where most of the rain fell in 10 minutes or less. The model adequately simulated the runoff of paraquat, trifluralin, and diphenamid during the runoff events. However, the model's capability, extensibility, and utility should be put in perspective. Another version of the current model is contemlated to simulate runoff of mobile chemicals, like NO(3)- of C1-. A vital component of this model must be subsurface water transport. The current model provides a conceptual base for extension and refinement to include runoff of mobile chemicals. (Rowe-East Central)
W78-11308

PHOSPHORUS LOSS BY STREAM TRANSPORT FROM A RURAL WATERSHED: QUANTITIES, PROCESSES, AND SOURCES,
Pennsylvania Univ., Philadelphia.
A. H. Johnson, D. R. Bouldin, E. A. Goyette, and A. M. Hedges.

Descriptors: *Water pollution sources, Sampling, *Phosphorus, Watersheds, *Suspended solids, Runoff, Sewage, Agriculture, Fertilizers, *Nonpoint pollution sources, Manure, *Dissolved phosphorus, Particulate phosphorus.

Phosphorus losses by stream transport in Fall Creek, which drains a rural watershed in central New York, were studied during a 20-month period. Fall Creek was sampled at several locations over a range of discharge conditions. Sampling efforts were concentrated during storm runoff periods. Estimates of phosphorus loss were obtained, and estimates of the standard errors were calculated.

Phosphorus loss associated with suspended solids accounted for 78% of the total exported. Dissolved inorganic fractions accounted for 14%. Dissolved organic fractions accounted for 8%. Approximately 22% of the dissolved phosphorus lost from the watershed was derived from diffuse sources associated with farming, 44% was derived from natural geochemical processes, and 34% from point source inputs. Less than 1% of the phosphorus applied to the landscape in chemical fertilizer and manure was lost from the watershed in dissolved form. (Merryman-East Central)
W78-11341

FATE OF TRACE ELEMENTS IN SEWAGE SLUDGE-AMENDED SOILS,
Dayton Univ., Ohio. Dept. of Geology.
C. J. Ritter, C. R. Cothern, and E. E. Zamierowski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 053, Price codes: A10 in paper copy, A01 in microfiche. Ohio State University, Columbus, Water Resources Center, Completion Report No 519X, 1978. 200 p. OWRT B-065-OHIO(1).

Descriptors: *Sewage sludge, Soils, *Trace elements, Chemical analysis, *Plant growth, *Translocation, *Percolation, *Heavy metals, Growth chambers, Cadmium radioisotopes, Phosphates, Phytotoxicity, Organic matter, Inorganic compounds, Groundwater, Mineralogy, X-ray diffraction, Optical properties, Cadmium, Copper, Nickel, Lead, Zinc, Ohio, *Pollutant identification, *Dayton(Ohio), *Atomic absorption spectroscopy, Zonal centrifugation, Compound identification, Electron spectroscopy, DTPA-extraction, Spinach, Sugar beet, Radioautography, Heavy liquid density gradient.

Uptake of trace amounts of Cd, Cu, Ni, Pb and Zn by plants grown in sewage sludge-amended soil from the Dayton, Ohio, area was determined. Sludge from the industrialized city of Dayton contains substantial amounts of trace elements, whereas that from non-industrialized Englewood has considerably smaller amounts. Zonal centrifugation was used to fractionate sludge and soil. Up to 75 weight percent of sludge has low density and is mostlyorganic material. Seventy-five weight percent of the total trace elements in sludge are in organic-rich fractions and are believed to be in organic compounds. Data from electron spectroscopy for chemical analysis (ESCA) indicates that Zn and Cu are bonded to O in sludge. Compounds of the carboxyl group are the most likely hosts. Sugar beet and spinach were grown in conrolled growth chambers. Addition of any amount of Dayton sludge reduced plant yield, whereas addition of Englewood sludge increased plant shoot dry weight. Heavy metal uptake by plants grown in soil amended with Dayton sludge was greater than by plants grown in Englewood sludge-amended soil, particularly for Cd, Cu, and Zn. Percolation studies of heavy metals in soil columns show that they do not move below 15 cm in high clay soil, nor below 40 cm in high sand soil.
W78-11363

TOXIC METAL CONCENTRATION OF THE WATER TABLE AS AFFECTED BY POULTRY MANURE,
Delaware Univ., Newark. Dept. of Plant Science.
W. C. Liebhardt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 121, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, October 1977. 17 p, 10 tab. OWRT A-035-DEL(1), 14-34-0001-7016.

Descriptors: *Heavy metals, *Zinc, Soils, Groundwater, *Farm wastes, *Poultry, Water wells, Sampling.

One acre plots received annual applications of poultry litter from 1972 to 1975 at rate of 0, 6, 12, 24, and 80 tons per acre. Water samples from well points indicated a high concentration of zinc in the water table. However, soil samples taken at one foot intervals in both 1975 and 1976 showed there was no indication of any downward movement of zinc. During the summer of 1976 samples of water from borings to the water table and well point samples conclusively showed that the previous high concentration of zinc in the water table was an artifact of the well points. The well point samples were high whereas the water samples taken from the borings were relatively low. Analysis of soil also showed that there was no indication of downward movement of arsenic, copper and manganese. Extraction of soil with several extractants from an experiment consisting of eight poultry litter treatments and four replications showed that 0.05 M EDTA is an acceptable single extractant for copper, manganese and zinc with respect to this extractant being able to detect addition of these heavy metals from poultry litter.
W78-11370

PHOTOCHEMICAL DEGRADATION OF MALATHION,
Alaska Univ., College. Inst. of Water Resources.
M. Schneider, and G. W. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 115, Price codes: A02 in paper copy, A01 in microfiche. Fairbanks. Report No. IWR-91, March 1978. 11 p, 1 fig, 2 tab, 10 ref. OWRT A-057-ALAS(1), 14-34-0001-6002.

Descriptors: *Pesticide residues, *Insecticides, *Degradation(Decomposition), Phosphates, Organic compounds, Triphosphates, *Malathion, *Photodecomposition.

The objective was to extend the qualitative and quantitative knowledge about the persistence and photodecomposition of malathion, a thiophosphate insecticide. Test plots were sprayed with malathion in aqueous solution and cores were taken periodically to determine the insecticide's persistence. The malathion was removed from the samples by acetone extraction. Analysis of the samples taken two days after spraying indicated that virtually all the malathion sprayed on the plots was still there.
W78-11374

HYDROSPHERIC TRACE ELEMENTS AND THEIR APPLICATION IN TRACING WATER POLLUTANTS,
Oregon State Univ., Corvallis. Dept. of Chemistry.
W. D. Loveland.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 114, Price codes: A05 in paper copy, A01 in microfiche. Oregon State University, Water Resources Research Institute, Completion Report WRRI-59, July 1978. 86 p, 14 fig, 41 tab, 32 ref, append. OWRT A-043-ORE(1).

Descriptors: *Tracing techniques, Pollutant detectors, *Trace elements, *Pollution monitoring, Rare earth elements, *Pollutant identification, *Path of pollutants, *Neutron activation analysis, *Willamette River(Ore), *Oregon.

In recent years, there has been interest in attempts to develop tracer technologies which will be attractive alternatives to conventional radiotracer, chemical tracer, and fluorescent dye technologies. Principal findilngs are summarized of a research project to develop certain rare earth elements with short-lived activation products as stable activable tracers for fluid-bound pollutants in fresh waters. The rare earths are easily detected by instrumental neutron activation analysis allowing long range pollutant tracing and the use of environmentally insignificant tracer levels. The use of short-lived activation products allows rapid sample analysis and thus makes the tracers more cost competitive. (Buckley-Oregon St).
W78-11375

FRESHWATER INFLOW AND ITS EFFECT ON THE SALINITY AND BIOTA OF SHALLOW LAGOONS, (PARTS I AND II),
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
For primary bibliographic entry see Field 2L.
W78-11381

IMPACT OF URBAN RUNOFF ON WATER QUALITY IN THE OCCOQUAN WATERSHED,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-11383

POLYCHLORINATED BIPHENYL (PCB) DEGRADING BACTERIA AND PCB IN ESTUARINE AND MARINE ENVIRONMENTS,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-11430

SURFACE CIRCULATION AND REPLACEMENT OF WATER IN MONTEREY BAY,
San Jose State Univ. CA.; and Moss Landing Marine Labs., CA.
W. W. Broenkow, and W. M. Smethie, Jr.
Estuarine and Coastal Marine Science, Vol 6, No 6, p 583-603, June 1978. 11 fig, 4 tab, 50 ref. NOAA 2-35137, 04-5-158-20.

Descriptors: *Water circulation, *Bays, *California, *Tidal waters, Pollutants, Path of pollutants, Water pollution, Currents(Water), Coasts, Winds, Salinity, Temperature, Water temperature, Discharge(Water), Rivers, Nitrates, Ammonia, Sewage, Upwelling, Estuaries, *Monterey Bay(Calif).

Observations in Monterey Bay for 27 months were used to describe net surface circulation and nutrient distributions. Surface water characteristics are modified slightly in the northern and southern bay compared to mid-bay. Local winds correlate well with upwelling episodes. The data suggested that upwelling occurs predominantly along the coast south of the bay, and the effects of recent upwelling are observed within the bay due to a general northerly flow. Internal tidal mixing promotes a net upward transport of cool, nutrient-rich water at the head of Monterey Submarine Canyon. A nearshore residence time of 6 days (2- to 12-day range) was determined by temperature, nutrients, and sewage-derived ammonia spring and summer) and by freshwater replacement (during winter). These residence times agree with direct current meter observations. The predominatly northward flow through the bay suggested by the distributions agrees with current meter measurements, the alignment of the canyon axis, and offshore geostophic observations. (Sims-ISWS)
W78-11431

AN IMPROVED SOIL-SAMPLING PROCEDURE FOR THE PREDICTION OF DISSOLVED INORGANIC PHOSPHATE CONCENTRATIONS IN SURFACE RUNOFF FROM PASTURE,
Massey Univ., Palmerston North (New Zealand). Agricultural and Horticultural Sciences.
For primary bibliographic entry see Field 5A.
W78-11432

EARTH RESOURCES DATA ACQUISITION SENSOR STUDY, PERIOD: DECEMBER 1, 1974-MAY 31, 1975,
Alabama Univ., Huntsville. School of Graduate Studies and Research.
For primary bibliographic entry see Field 5A.
W78-11443

WATER QUALITY ASSESSMENT YAKIMA RIVER BASIN,
Washington State Dept. of Ecology, Olympia.
P. Lee, D. Glantz, and R. Pine.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 053, Price codes: A09 in paper copy, A01 in microfiche. Report 76-17, October 1976. 188 p, 66 fig, 73 tab, 12 ref, 3 append.

Descriptors: *Water quality, *Rivers, *Washington, Water pollution, Water pollution sources, Dams, Irrigation, Wastes, Pollutants, Path of pollutants, Farm wastes, Domestic wastes, Industrial wastes, Sediments, Flow, Flow control, Precipitation(Atmospheric), Rainfall, *Yakima River(Wash).

The water quality of the Yakima Basin is affected by man's activity probably more than any other basin in the state. Analysis of the chemical and bacteriological parameters, routinely monitored by the Department of Ecology (DOE) and others, indicated that the Yakima River water quality deteriorates significantly as it flows toward the Columbia River. The classic 'fishability' and 'swimmability' uses are minimal, especially in the reaches of the river below Sunnyside Dam. This water quality deterioration is attributed primarily to the intensive use of the river for various agricultural needs. The flow of the Yakim, Naches, and Cle Elum rivers is altered to maximize the amount of available water for agricultural use during the dry summer and fall months. The release of water impounded in upstream storage reservoirs impacts water quality in the upper Yakima. The increased flow then becomes part of the intricate use and reuse of water through the complex system of dams, diversions, irrigation drains, and canals that proliferate the study area. Large volumes of surface runoff with high concentrations of suspended sediments, nutrients and coliform bacteria are the result of these irrigation activities. The above factors emphasize the 'artificiality' of the basin and how difficult it is to define water quality in terms of natural causes or as a result of any single human activity. (Sims-ISWS)
W78-11450

NONPOINT SOURCE POLLUTION FROM AGRICULTURAL RUNOFF,
Cornell Univ., Ithaca, NY. Dept. of Civil and Agricultural Engineering.
D. A. Haith, and J. V. Dougherty.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Chemical Engineers, V. 102, No. EE5, p. 1055-1069, 1976. 1 fig, 7 tab, 39 ref.

Descriptors: *Water pollution sources, *Agricultural runoff, Nitrogen, Phosphorus, Agricultural watersheds, *Nonpoint pollution sources, Snowmelt runoff.

An operational procedure has been developed which is suitable for estimating nonpoint source water pollution due to runoff from agricultural land and is sensitive to regional variations in weather, soils, and crop management. Although not presently applicable to snowmelt runoff, the procedure could be extended to winter runoff by use of suitable snowmelt estimating methods. Nitrogen and phosphorus in agricultural runoff were estimated for a five-watershed area totaling 578 sq km in Broome and Tioga Counties, N.Y., for the years 1971 and 1972. Comparison was made with two other estimates which were obtained using areal loading factors (losses of nutrients per unit area). Although the three different estimates were of comparable orders of magnitude, the loading factor estimates were not sensitive to the soils, weather, and crop distributions of the study region, and may overestimate losses of nitrogen in agricultural runoff. (East Central)
W78-11460

THE NEEDS FOR WATER QUALITY MODELS ON AGRICULTURAL WATERSHEDS,
Southeast Environmental Research Lab., Athens, GA.
H. P. Nicholson.
Journal of Environmental Quality, V. 4, No. 1, p 21-23, Jan.-March, 1975. 6 ref.

Descriptors: *Model studies, *Water pollution control, Agriculture, Municipal wastes, Industrial wastes, Watersheds, Sediments, Agricultural chemicals, Pathogenic bacteria, Heavy metals, Mathematical models, Farm wastes, *Non-point pollution sources, Pollution abatemcnt, Crop residues.

The Federal Water Pollution Control Act Amendments of 1972 emphasize the need to control pollution associated with agricultural activities as well as pollution associated with cities and industries. The full significance of agricultural pollution is from non-point sources, something more than the application of standard collection and treatment systems is needed for pollution control. Management of such pollution will depend heavily upon mathematical models now under development. Management programs should be planned and implemented for complete drainage basins. The potential agricultural pollutants that must be managed include sediments, agricultural chemicals, animal wastes, crop residues, pathogens, and possibly heavy metals. (Merryman-East Central)
W78-11505

THE ROLES OF NUTRIENT CYCLING AND RADIANT ENERGY IN AQUATIC COMMUNITIES,
For primary bibliographic entry see Field 5C.
W78-11508

PRODUCTION OF VOLATILE SULFUR COMPOUNDS DURING THE DECOMPOSITION OF ALGAL MATS,
Wisconsin Univ., Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W78-11510

EUTROPHICATION POTENTIAL OF DAIRY CATTLE WASTE RUNOFF,
Utah State Univ., Logan.
For primary bibliographic entry see Field 5C.
W78-11513

ATTENUATION OF LIGHT IN NATURAL WATERS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 5C.
W78-11516

FACTORS AFFECTING NUTRIENT LOADS IN SOME IOWA STREAMS,
Iowa State Univ., Ames. Dept. of Animal Ecology.
J. R. Jones, B. P. Borofka, and R. W. Bachmann.
Water Research, V. 10, No. 2, p. 117-122, 1976. 2 fig., 7 tab., 42 ref.

Descriptors: *Watersheds(Basins), *Iowa, *Water pollution sources, Nitrogen, Phosphorus, Nutrient, Runoff, Feedlots, Croplands.

The export and concentration of inorganic nitrogen and total phosphorus from 34 watersheds in a northwestern Iowa lake district were measured during March 1971-August 1973. Annual nutrient losses were appriximately 0.35 kg ha-1 P, 6.7 kg ha-1 NO -N, and 1.0 kg ha-1 NH3-N. A statistical analysis of the relationship between land-use and plant nutrients was used to determine differences among streams. Animal units in feedlots were significantly correlated with phosphorus and ammonia nitrogen (mg l-1 and kg ha-1 yr-1). Nitrate nitrogen was negatively correlated with the percentage of watershed in marshland. Tile drainage and surface runoff from grasslands, feedlots, cornfields, and soybean fields were analyzed for nitrogen and phosphorus in spring 1974; mean values are given. (East Central)
W78-11525

MERCURY AND CHLORINATED HYDROCARBONS IN PLANKTON OF LAKE PAIJANNE, FINLAND,
Jyvaskyla Univ. (Finland). Dept. of Biology.
J. Sarkka, M. Hattula, J. Janatuinen, and J. Paasivirta.
Environmental Pollution, Vol. 16, No. 1, p. 41-49, 1978. 1 fig, 5 tab, 20 ref.

Descriptors: *Lake Paijanne(Finalnd), *Plankton, *Mercury, *Polychlorinated biphenyls, *DDT, *Food chain, *Finland, *Pulp wastes, Bioaccumulation, Lakes, Phytoplankton, Zooplankton, Chlorinated hydrocarbons, DDE, Industrial wastes, Sewage, Pulp and paper industry, Pesticide residues, Path of pollutants, Water pollution sources.

Residues of mercury and chlorinated hydrocarbons were determined for plankton collected in Lake Paijanne, Finland during 1972-74. Polychlorinated biphenyls (PCBs) were the greatest contaminants, with an average dry weight content of 290 micrograms/kg, followed by mercury with 178 and DDE + DDT with 91 micrograms/kg. Spatial and temporal sampling differences were generally small. The DDE + DDT content of the largest size fraction (350 micrometers) wasmostly higher than in the smaller fractions (100, 50, and 25 micrometers). Correlation between BCB and DDE + DDT content was highly significant. Mercury content was similar to marine areas, but lower than in other polluted regions. PCB and DDE + DDT content was generally lower than in marine plankton. Lake Paijanne receives its waste loading principally from sulfite and sulfate mill wastes, sewage and paper mill effluents. DDD and dieldrin were not found, and aldrin was found only at one station. DDT was almost totally prohibited in 1971 and PCBs have not been used in very great amounts in the lake's drainage basin (240 tons were used in Finland in 1969). While bioaccumulation from phytoplankton to zooplankton appears to occur for DDE and total DDT, none was indicated for PCBs and mercury. None of the residue levels correlated significantly with the fat content of the sample. (Lynch-Wisconsin)
W78-11526

POLLUTANTS FROM LAND-BASED SOURCES IN THE MEDITERRANEAN,
World Health Organization, Geneva (Switzerland).
R. Helmer.
AMBIO, Vol. 6, No. 6, p 312-316, 1977. 6 fig, 1 tab, 2 ref.

Descriptors: *Mediterranean Sea, *Water pollution sources, *Waste disposal, *Pollutants, *United Nations, Seas, Rivers, Municipal wastes, Industrial wastes, Sewage, Agricultural runoff, Nutrients, Radioactive wastes, Nuclear powerplants, Organic matter, Phosphorus, Nitrogen, Metals, Pesticide residues, Fallout.

The first comprehensive compilation of major land-based pollution sources to the Mediterranean Sea was made by the United Nations Environment Program (UNEP). Data are presented in a consolidated table. Conclusions: (1) domestic sources largely contribute organic matter,nutrients, and detergents; (2) industrial waste discharges are responsible for considerable amounts of organic matter, in addition to phenol, metla, and mineral oils; (3) agricultural runoff accounts for some o the nutrient input, and suspended solids and pesticide

discharges are largely due to soil erosion; (4) Major rivers transpot an integrated load of domestic, industrial, and agricultural pollutants from entire drainage basins, and contribute great amounts of suspended solids, nutrients, metla,s andpesticides; and (5) total radioactive discharge from nuclear installations may be rather low compared with radioactive contaminants in other discharged materials and due to earlier weapon tests. Load assessment was made for each pollutant individually, and geographical distribution of pollution loads was based on 10 regional subdivisions of the Mediterranean basin. In estimating annual loads, a distinction was made between pollution originating in the coastal zone, and substances carried by rivers into the sea; an attempt was made to distinguish background and pollution loads in the rivers. (Lynch-Wisconsin)
W78-11534

A SUMMARY OF THE BIOGEOCHEMISTRY OF NITROGEN COMPOUNDS IN GROUND WATER,
California State Univ., Chico.
J. Behnke.
Journal of Hydrology, V. 27, No. 1/2, p. 155-167, Oct., 1975. 4 fig., 55 ref.

Descriptors: *Nitrates, *Nitrogen compounds, Leaching, Groundwater pollution, *Water pollutant sources.

This article attempts to briefly summarize the history of nitrogen compounds in the bioshell and to relate nitrates to the biogeochemistry of other nitrogen compounds invoked in the nitrogen cycle. The article summarizes groundwater nitrate occurrences and provides the reader with an updated bibliography concerning such occurrences. Most reported cases of excessive nitrate build-ups in shallow groundwaters seem to be related to the downward leaching of nitrogen by surface water. Such leaching requires a relatively open geologic profile between the ground surface and the water table. Reported sources for groundwater nitrate contamination include decaying plant and animal material, organic sediments, agricultural fertilizers, domestic sewage, and areas of high density animal confinement. (Bates-East Central)
W78-11535

NUTRIENTS AND PRODUCTIVITY AS INDICATORS OF THERMAL EFFLUENT UPWELLING INTERACTIONS IN LAKE MICHIGAN,
Argonne National Lab., IL.
E. M. Yaguchi.
Journal of Great Lakes Research, vol. 3, no. 1-2, p57-64, 1977. 3 fig., 2 tab., 42 ref.

Descriptors: *Thermal pollution, *Lake Michigan, Productivity, Great Lakes, Nutrients, Phytoplankton, Growth rates, Water pollution sources, Water temperature, Currents(Water), Population, Powerplants, Thermal stratification, Nuclear powerplants, Diversity.

During the summer of 1975, a field study was undertaken to examine separate and combined effects of upwelling and a thermal discharge on nutrients, productivity quotients, and phytoplankton populations in an inshore region of southwestern Lake Michigan. Reactive silicat concentrations were more than doubled during the upwelling (compared to those during stable hydrological conditions); chlorophyll a concentrations, phytoplankton diversity, and cell numbers per milliliter were also significantly greater. Productivity quotients were lower by nearly one-half during upwelling. The Zion Nuclear Plant discharges water warmed an average of 10 C to the lake via a submerged high-velocity discharge. Few significant differences in chemical and biological parameters were attributable to the resulting warm-water plume. Phytoplankton spcific growth rates in the plume were increased over those at control stationsonly during upwelling. Nutrient limitation is implicated as one of several factors in the response of phytoplankton to locally increased temperature. (EIS-Katz)
W78-11537

LONG-TERM VARIATION OF ORGANOCHLORINE RESIDUES AND ASSEMBLAGES OF EPIBENTHIC ORGANISMS IN A SHALLOW NORTH FLORIDA (USA) ESTUARY,
Florida State Univ., Tallahassee. Dept. of Biological Science.
For primary bibliographic entry see Field 5C.
W78-11538

WATER POLLUTION FROM NONPOINT SOURCES,
Midwest Research Inst., Kansas City.
A. D. McElroy, S. Y. Chiu, J. S. Nebgen, A. Aleti, and A. E. Vandegrift.
Water Research, V. 9, No. 7, p 675-681, July, 1975. 3 tab, 18 ref.

Descriptors: *Water pollution, *Nonpoint pollution sources, Public health, Agriculture, Silviculture, Runoff, Mining, Construction, Return flow, Erosion, Sediment, Acid mine drainage, Salinity, Heavy metals, Nutrients, Pesticides, Thermal discharges, Radioactivity, Microbial pollution, *Industrial wastes.

The aim of this study was to assess the nature and extent of non-point source pollution in the United States from 4 major industrial activities: agriculture, silviculture, mining and construction. In agriculture, the major pollutant are sediment, nutrients, pesticides, organic wastes and microbial pollution. Pollutants from silvicultural operations include sediment, nutrients, pesticides and thermal discharges. Erosion sediment, acid mine drainage, salinity and heavy metals are major pollutants from mining. Sediment is the primary pollutant from the construction industry. (Bates-East Central)
W78-11543

DDT AND PCB LEVELS AND REPRODUCTION IN RINGED SEAL FROM THE BOTHNIAN BAY,
Oulu Univ. (Finland). Dept. of Zoology.
E. Helle, M. Olsson, and S. Jensen.
Ambio, Vol. 5, No. 4, p 188-189, 1976. 1 fig, 2 tab, 18 ref.

Descriptors: *Mammals, *Marine animals, *Reproduction, *Water pollution effects, *DDT, *Polychlorinated biphenyls, Pesticides, Residues, Chlorinated hydrocarbon pesticides, Animal physiology, Fertility, Populations, Pesticides, Path of pollutants, *Pusa hispida, *Bothnian Bay(Finland), *Sub-lethal effects, *Baltic Seal.

The serious DDT and PCB contamination of the Baltic might explain the rapid decrease of the Baltic seal populations. In the Bothnian Bay only 27 percent of the Ringed Seal females of reproductive age are pregnant, compared to a normal level of 80-90 percent in areas with low levels of pollution. Significantly higher levels of both DDT and PCB have been found in the non-pregnant females compared to the pregnant ones. In November, about four months before normal pupping, half of the non-pregnant females showed enlarged uteri and scars in the uterine wall. This indicates that implantation occurred, followed by resorption or absorption. Comparing analytical data on California Sea Lions, where similar reproductive disturbances have been reported, it seems probable that PCB and not DDT substances are responsible for the perturbation of reproduction in seals. (EIS-Katz)
W78-11550

IONIZATION OF AMMONIA IN SEAWATER: EFFECTS OF TEMPERATURE, PH, AND SALINITY,
Sea Research Foundation, West Hartford, CT. Inst. for Aquarium Studies.
For primary bibliographic entry see Field 5C.
W78-11553

LEAD ENRICHMENT IN SHELLS OF MYTILUS EDULIS,
Uppsala Univ. (Sweden). Dept. of Paleontology.
For primary bibliographic entry see Field 5C.
W78-11554

PCB LEVELS CORRELATED WITH PATHOLOGICAL CHANGES IN SEAL UTERI,
Oulu Univ. (Finland). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-11555

ANTHROPOGENIC SUBSTANCES IN SEAL FROM THE BALTIC: METHYL SULFONE METABOLITES OF PCB AND DDE,
Stockholm Univ. (Sweden). Wallenberg Lab.
For primary bibliographic entry see Field 5C.
W78-11559

IN SITU UPTAKE OF MERCURY BY THE INTERTIDAL MUSSEL, MYTILUS CALIFORNIANUS,
Southern California Coastal Water Research Project, El Segundo.
R. P. Eganhouse, and D. R. Young.
Marine Pollution Bulletin, Vol. 9, p 214-217, 1978. 2 fig., 2 tab., 13 ref.

Descriptors: *Mercury, *Absorption, *Mussels, Waste water(Pollution), Waste water disposal, Animal physiology, Animal metabolism, Path of pollutants, Chemical analysis, Heavy metals, Bottom sediments, Municipal wastes, Industrial wastes, *Tissue analysis, *Bioaccumulation, *Mytilus.

The in situ uptake of mercury in tissues of Mytilus californianus was studied by exposing control specimens to waters at four depths near a submarine wastewater discharge for a period of 24 weeks. The response patterns observed for digestive gland, adductor muscle and gonadal tissues were strikingly different. Digestive gland concentrations increased rapidly to the heightened levels found for indigenous specimens. On the other hand, changes in the mercury content of adductor muscle were not statistically significant, and gonadal tissues generally exhibited a low rate of increase. No correlation with depth was observed. (EIS-Katz)
W78-11565

CONCENTRATION OF IODINE AND BROMINE BY PLANTS IN THE SEAS OF JAPAN AND OKHOTSK,
Akademiya Nauk SSSR, Vladivostok. Inst. of Chemistry.
G. N. Saenko, Y. Y. Kravtsova, V. V. Ivaneneko, and S. I. Sheludko.
Marine Biology, Vol. 47, 1978, p 243-250. 4 tab., 1 fig., 29 ref.

Descriptors: *Iodine, *Bromine, *Halides, *Marine algae, Algal, Rhodophyta, Phaeophyta, Chlorophyta, Pacific Ocean, Bioindicators, Methodology, Chemical analysis, Laboratory tests, *Iodine concentrations, *Bromine concentrations, Seaweed, *Sea of Japan, *Sea of Okhotsk.

Iodine and bromine content were measured in 24 species of red (Rhodophyta), brown (Phaeophyta) and green (Chlorophyta) seaweeds and 2 species of higher water plants (Embryophta) from the Sea of Japan, as well as in 12 species of the above-

cited taxa and 1 species of flowering plant from the Sea of Okhotsk. Phaeophyta and Rhodophyta were richest in iodine and bromine content. Representatives of the order Ceramiales (Rhodophyta) had high iodine and bromine contents. Thus, iodine concentrations in Ptilota filicina, Campylaephora hypnaeoides and Myriogramme yezoensis, a new iodine concentrator discovered by us, amount to 0.42, 0.094 and 0.75%, respectively. Bromine content in representatives of the family Rhodomelaceae was 3.36 and 3.74% in Japan Sea and Okhotsk Sea Rhodomela larix, respectively. Polysiphonia japonica (Rhodomelaceae) is a newly discovered concentrator of bromine (3.20%). Many species of the order of Laminaria japonica, L. cichoriodes, L. inclinatorhiza, Cymathaere japonica and Alaria marginata. The Br:I ratio for all the species except those that concentrated iodine, was more than 1. Seaweeds that grow at greater depths showed increased iodine and bromine contents. A tendency toward increased iodine content was observed in speices growing further to the North. Iodine and bromine were accumulated selectively by various organs of Sargassum pallidum. (EIS-Katz)
W78-11567

MARINE ALGAE AS COLLECTORS OF IRON ORE DUST,
Glasgow Univ. (Scotland). Dept. of Botany.
A. D. Boney.
Marine Pollution Bulletin, Vol 9, No 7, 1978, p 175-180. 3 tab, 6 fig, 10 ref.

Descriptors: Bioindicators, *Marine algae, *Metals, *Sediments, Intertidal areas, Dusts, Mineral industry, Mine wastes, Seawater, Monitoring, Particle shape, Particle size, *Thallus construction, *Iron ore dust, *Plumaria, *Cladophora, *Pelvetia, Ore dust, Retention.

Marine algae from intertidal habitats, when shaken in iron ore dust suspensions in seawater, take up appreciable quantities of the dust load. The quantities taken up vary with the modes of thallus construction. Considerable quantities of ore dust are retained by the plants after shaking for periods of up to 15 h in dust free seawater. Marine algae can be used as a monitoring system for ore dust loading of seawater due to accidental spillages in the vicinity of ore unloading terminals. (EIS-Katz)
W78-11569

HEAVY METALS IN THE BURROWING BIVALVE SCROBICULARIA PLANA FROM CONTAMINATED AND UNCONTAMINATED ESTUARIES,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5C.
W78-11570

A SEASONAL STUDY OF THE DISTRIBUTIONS OF SURFACE STATE VARIABLES IN LIVERPOOL BAY. I. WINTER DATA,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
P. Foster, D. T. E. Hunt, K. B. Pugh, G. M. Foster, and G. Savidge.
Journal of Experimental Marine Biology, Vol. 29, No. 3, p 303-313, 1977. 5 fig, 3 tab, 17 ref.

Descriptors: *Liverpool Bay(United Kingdom), Chemical properties, *Winter, *Surface waters, *Physical properties, *Biological properties, *Distribution, *Saline water-freshwater interfaces, *Water pollution effects, Seasonal, Bays, United Kingdom, Spatial distribution, Temporal distribution, Parameters, Baseline studies, Eutrophication, Salinity, Nutrients, Regression analysis, Winds, Effluents.

Physical, chemical, and biological characteristics of Liverpool Bay (United Kingdom) surface waters were studied during six cruises in 1975; winer data (January and December) are presented in this report. The remaining cruises were in April, May, June, and September. Criteria are provided for judging subsequent spatial and temporal changes among the variables. Surface distribution maps were markedly different in January and December, attributed to the influence of wind. Despite the visual spatial dissimilarity, principal component analysis revealed a general homogeneity dominated by conservative physical mixing of sea and fresh waters. No internal sources or sinks, either man-made or nautral, were encountered. Biological influences upon chemical distribution were assumed to be minimal during the midwinter crusises. Surface variability of salinity, temperature, transparency, and dissolved concentrations of nitrate, nitrite, ammonia, silicate, and phosphate was continuously recorded. Linear regression analysis showed highly significat correlations among all characteristics except transparency. Freshwater-seawater interactions predominant in influcencing overall relationships, and observed distribution were apparently physically induced. (Lynch-Wisconsin).
W78-11585

TOTAL PHOSPHORUS MODEL FOR THE GREAT LAKES, (DISCUSSION),
Cleveland State Univ., OH.
For primary bibliographic entry see Field 5C.
W78-11623

WISCONSIN TRIBUTARY LOADINGS TO THE UPPER GREAT LAKES,
Wisconsin Dept. of Natural Resources, Madison. Div. of Environmental Protection.
D. Ryan, and M. Stokstad.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 488, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-905/4-75-003, August 1975. 57 p, 8 fig, 11 tab, 4 ref, 3 append. C-2, ULRG-IJC, 68-01-1875.

Descriptors: *Wisconsin, *Tributaries, *Lake Superior, *Bois Brule River(WI), *Bad River(WI), *Montreal River(WI MI), *Nemadji River(WI MN), *Water pollution sources, Rivers, Great Lakes, Data collections, Benthic fauna, Red clay area, Nitrogen, Phosphorus, Silica, Hardness(Water), Turbidity, Secchi disks, Suspended solids, Metals.

Results of intensified water quality sampling in 1973-74 on four Wisconsin tributaries to Lake Superior--the Nemadji, Bois Brule, Bad, and Montreal Rivers--indicate excellent water quality (with local exceptions) supporting diverse and abundant populations of aquatic life. Primary sampling stations were established on the Bois Brule, Bad, and Montreal Rivers during July 1973, and a station on the Nemadji was added in January 1974. The three phases of the program were: (1) chemical analysis of monthly samples (which will be continued following completion of the current study); (2) supplementary sampling during spring runoff and for additional parameters three times during the year; and (3) a study of local effects by means of more intensive surveys twice on each river during summer 1974. Data are included in appendices and in the text. Benthological data are presented in map-graphs. A striking characteristic of the Nemadji (and the Bois Brule and Bad Rivers to a lesser extent) is a high solids load during spring runoff, due to abundance of red clay in the watershed. Total benthic community in the Nemadji was varied but relatively sparse, while the Bad River supported a rich and relatively abundant benthic fauna. The reputation of the Bois Brule as an excellent clean-water trout stream is borne out by the survey. The Montreal River experiences bacteriological contamination in the Hurley vicinity from sewage treatment plant effluents from Hurley and Ironwood, Michigan. (Lynch-Wisconsin)
W78-11628

HYDROCARBONS OF OYSTERS AND SHORT-NECKED CLAMS IN HIROSHIMA BAY,
Hiroshima Univ. (Japan). Faculty of Integrated Arts and Sciences.
For primary bibliographic entry see Field 5C.
W78-11635

TRANSFER OF COBALT-60 FROM PHYTOPLANKTON TO THE CLAM (MERCENARIA MERCENARIA),
National Inst. of Radiological Sciences, Nakaminato (Japan). Marine Radio-Ecological Research Station.
For primary bibliographic entry see Field 5C.
W78-11636

THE WEST FALMOUTH SPILL - FLORIDA, 1969,
Woods Hole Oceanographic Institution, MA. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11638

FATE AND EFFECTS OF OIL IN MARINE ANIMALS,
Woods Hole Oceanographic Institution, MA. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11639

A GENETIC LOOK AT FISH EGGS AND OIL,
National Marine Fisheries Service, Milford, CT. Milford Lab.
For primary bibliographic entry see Field 5C.
W78-11640

SEASONAL DYNAMICS OF THE HEMATOLOGICAL PARAMETERS IN SOME BLACK SEA FISHES AND CHANGES THEREIN AFTER EXPERIMENTAL POISONING WITH PETROLEUM PRODUCTS,
All-Union Inst. of Marine Fisheries and Oceanography, Batumi (USSR), Georgian Div.
For primary bibliographic entry see Field 5C.
W78-11643

THE CHEDABUCTO BAY SPILL - ARROW, 1970,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia).
J. H. Vandermeulen.
Oceanus, Vol 20(4), 1977, p. 31-39 3 tab, 8 fig, 11 ref.

Descriptors: *Oil wastes, *Oil pollution, Water pollution effects, Marine benthos, Sediments, Animal physiology, Pathology, Biochemistry, Atlantic ocean, Path of pollutants, Degradation(Decomposition), *Aquatic fauna, Aquatic flora, Marine environment, *Clams, Methodology, Canada, *Chedabucto Bay, *Nova Scotia, Bunker C Oil, Arrow Oil Spill.

A study was made of the biological damage and recovery of Chedabucto Bay following the wreck of the Florida. The Bunker C petroleum hydrocarbons still resident on or in the shoreline sediments are measured. Also measured are the rates of hydrocarbon movement between water column and sediment, the degradation rates and the tissue oil load and physiological responses of oiled organisms.
W78-11648

ORGANOCHLORINE AND MERCURY RESIDUES IN THE HARP SEAL (PAGOPHILUS GROENLANDICUS),
Guelph Univ. (Ontario). Dept. of Biomedical Sciences.
For primary bibliographic entry see Field 5C.
W78-11658

USE OF FRESHWATER MUSSELS TO MONITOR POINT SOURCE INDUSTRIAL DISCHARGES,
Eastern Michigan Univ., Ypsilanti. Center for Aquatic Biology.
R. B. Foster, and J. M. Bales.
Environmental Science and Technology, Vol. 12(8), 1978, p 958-962. 2 tab, 2 fig, 17 ref.

Descriptors: *Monitoring, *Benthos, *Industrial effluents, Mussels, Metals, Copper bioassay, Mortality, Toxicity, On-site investigations, Ohio, Water pollution effects, Path of pollutants, Animal physiology, Pathology, *Copper, *Muskingum River, *Copper electroplating wastes, Freshwater mussels, Quadrula quadrula, Tissue content, Accumulated body burden.

In-stream monitoring techniques were used to evaluate the effects of copper electroplating wastes on the mussel fauna of the Muskingum River. Laboratory effluent bioaccumulation tests were conducted to determine the potential of freshwater mussels to accumulate copper, which was the major effluent constituent. Mussels were also exposed in cages at various distances from the electroplating plant outfall and analyzed for copper content after 14, 30, and 45 days. The indigenous mussel fauna was also analyzed for copper content. Copper accumulation in the species tested was inversely related to body weight. Mortalities during effluent exposures occurred after 11 days and were associated with body burdens approaching 20 micrograms copper per gram of wet tissue weight. Analysis of caged mussel specimens when correlated with Muskingum River population surveys and natural background content of copper in freshwater mussels demonstrated an adverse impact of the electroplating plant within 21 km of the outfall. Mussels caged 0.1 km from the outfall accumulated 20.64 microgram Cu g-1 in 14 days, ten times the normal body burden of mussels at control stations upstream. The copper content of caged mussels at stations located further downstream, 5-53 km, declined as the distance from outfall increased. (EIS-Katz)
W78-11670

HEAVY METAL POLLUTION OF THE RIVER IRWELL (LANCASHIRE, UK) DEMONSTRATED BY ANALYSIS OF SUBSTRATE MATERIALS AND MACROINVERTEBRATE TISSUE,
Salford Univ. (England). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11672

DEHP IN THE VICINITY OF AN INDUSTRIAL AREA IN FINLAND,
Helsinki Univ. (Finland). Dept. of Environmental Science.
For primary bibliographic entry see Field 5C.
W78-11673

METAL CONCENTRATIONS IN SOME SEAWEEDS OF GOA (INDIA),
National Inst. of Oceanography, Panjim (India).
V. V. Agadi, N. B. Bhosle, and A. G. Untawale.
Botanica Marina, Vol. 21, p 247-250, 1978. 1 fig, 2 tab, 14 ref.

Descriptors: *Monitoring, *Copper, *Cobalt, *Lead, *Zinc, *Absorption, *Marine algae, Bioindicators, Manganese, Nickel, Algae, Path of pollutants, Primary productivity, Food chains, Aquatic plants, On-site investigations, Chlorohyta, Phaeophyta, Rhodophyta, Bioaccumulation, GOA, India.

Seventeen species of marine algae collected from five localities of Goa, were analysed for Co, Fe, Mn, Ni, PB, and Zn, using atomic absorption spectrophotomerer. All the seven metals showed considerable variations in their concentration. The role of different seaweeds as indicators of metal pollution is discussed in relation to the degree of accumulation of metals. (EIS-Katz)
W78-11674

CONTROL OF NONPOINT WATER POLLUTION FROM AGRICULTURE: SOME CONCEPTS,
Agricultural Research Service, Chickasha, OK.
For primary bibliographic entry see Field 5G.
W78-11681

UPTAKE, METABOLISM, AND EXCRETION OF DDT BY THE FRESH WATER SNAIL, VIVIPARA HELICIFORMIS,
Delhi Univ. (India). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-11686

PETROLEUM HYDROCARBONS IN MARINE SEDIMENTS AND ANIMALS FROM THE ISLAND OF MALTA,
Bristol Univ. (England). Dept. of Inorganic Chemistry.
M. Sammut, and G. Nickless.
Environmental Pollution, 1978, Vol 16, p 17-30. 4 tab, 7 fig, 38 ref.

Descriptors: *Oil, *Oil pollution, Sediments, *Marine fish, Marine biology, Sediments, Water pollution effects, Chemical analysis, *Path of pollutants, Methodology, Gas chromatography, Mediterranean, *Malta, Fossil fuels, *Fossil fuel hydrocarbons, Mullet, *Polynuclear aromatic hydrocarbons.

Marine sediments and animals from the coastal waters of the Mediterranean island of Malta were found to be contaminated with hydrocarbons of fossil fuel origin probably in the form of minute pelagic tar particulates. However, fossil fuels of local origin such as those used in pleasure craft may also be a contributing factor. Polynuclear aromatic hydrocarbons were identified in some of the sediments. These compounds were not detected in the marine animals, but PAH's were present in the gut contents of grey mullet (Mugil caphalus), a bottom feeder. (EIS-Katz)
W78-11691

ABSENCE OF ARYL HYDROCARBON HYDROXYLASE (AHH) IN THREE MARINE BIVALVES,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5A.
W78-11692

PRUDHOE CRUDE OIL IN ARCTIC MARINE ICE, WATER, AND SEDIMENT ECOSYSTEMS: DEGRADATION AND INTERACTIONS WITH MICROBIAL AND BENTHIC COMMUNITIES,
Louisville Univ., KY. Dept. of Biology.
R. M. Atlas, A. Horowitz, and M. Busdosh.
Journal of the Fisheries Research Board of Canada, vol. 35, p585-590, 1978. 5 fig., 2 tab., 7 ref.

Descriptors: *Oil, *Microbial degradation, Ecosystems, *Model studies, *Bottom sediments, *Arctic, Oil pollution, Oil spills, Organic compounds, Mortality, Benthic fauna, Biological communities, Biodegradation, Population, Gas chromatography, Prudhoe Crude Oil.

A variety of in situ models were used to simulate oil spills in different arctic ecosystems. Numbers of oil-degrading microorganisms were found to increase after oil contamination. Oil contamination of sediment resulted in mortality of indigenous invertebrates. Recolonization of oil-contaminated sediments began shortly after oil contamination but benthic communities were significantly different in oil-contaminated sediment compared with the control, 2 mo after the oil contamination. Petroleum hydrocarbons were degraded slowly. Ice greatly restricted losses of light hydrocarbons. Following initial abiotic losses, biodegradation of oil was limited and did not significantly alter the relative percentages of hydrocarbons in the residual oil. We concluded that petroleum hydrocarbons will remain in arctic ecosystems for prolonged priods after oil contamination. (EIS-Deal)
W78-11693

DISTRIBUTION AND ABUNDANCE OF HYDROCARBON-UTILIZING BACTERIA IN SEDIMENTS OF CHEDABUCTO BAY, NOVA SCOTIA, IN 1976,
Fisheries and Marine Service, Halifax (Nova Scotia).
J. E. Stewart, and L. J. Marks.
Journal of the Fisheries Research Board of Canada, Vol 35, p 581-584, 1978. 3 fig, 15 ref.

Descriptors: *Bottom sediments, *Oil, *Microbial degradation, *Bacteria, *Marine bacteria, *Bottom sampling, Oil pollution, Oil spills, Sediments, Biodegradation, Cytological studies, Microorganisms, Fuels, Water pollution effects, *Chedabucto Bay(NS), Canada.

An extensive reexamination of Chedabucto Bay, Nova Scotia, sediments was carried out in the summer of 1976 for comparison with data obtained shortly after the major oil spill in 1970. Only 2 of the 79 sediment samples examined microbiologically had large numbers of hydrocarbon-utilizing bacteria. The bulk of the sediments were, with regard to bacterial populations, comparable to areas described as 'clean', ie. no apparent or known contamination with oil. (EIS-Deal)
W78-11694

AROMATIC HYDROCARBONS IN BENTHIC ORGANISMS FROM COASTAL AREAS POLLUTED BY IRANIAN CRUDE OIL,
Institute of Marine Research, Bergen (Norway).
O. Grahl-Nielson, J. T. Staveland, and S. Wilhelmsen.
Journal of the Fisheries Research Board of Canada, vol. 35, p615-623, 1978. 6 fig., 2 tab., 12 ref.

Descriptors: *Oil, *Oil spills, *Aromatic compounds, *Benthic fauna, Oil pollution, Organic compounds, Beaches, Coasts, Water pollution effects, Gas chromatography, Crabs, Sediments, Animal physiology, *Crude oil, *Naphthalenes, Tissue analysis, Bioaccumulation, Mass fragmentographys.

This investigation was begun 1 mo after a spill of 2000 tons of Iranian crude oil polluted shores along the west coast of Norway in February 1976. It is based on mass-fragmentographic analysis of naphthalene, methyl-, dimethyl-, and trimethylnaphthalenes, phenanthrene, methyl- and dimethylphenanthrenes, dibenzothiophene, methyl-, dimethyl-, and trimethyldibenzothiophenes. Samples of stranded oil, water, and seven species of benthic organisms were collected periodically during the following year. During the lst mo of weathering the total amount of these aromatic compounds had decreased from 1.22% in the original oil to 0.76%, with a further decreasse to 0.2-0.3% during the next 3-4 mo. In the water the contentration of these compounds was approximately 2 micrograms/L (ppb) at the start of the sampling. At one of the investigated locations a chemical dispersant was used in cleaning the shores. This resulted in higher concentrations of the aromatic compounds in the water, up to 12 micrograms/L. The organisms studied had accumulated aromatic hydrocarbons up to an excess of 20 micrograms/g wet weight, 1 mo after the spill. Although seasonal and individual differences were large, the dibenzothiophenes appeared to be retained to a larger extent relative to the naphthalenes and phenanthrenes. (EIS-Deal)

W78-11696

TRACE ELEMENTS IN THE FLESH AND LIVER OF TWO FISH SPECIES FROM POLLUTED AND UNPOLLUTED AREAS OF THE AEGEAN SEA,
Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept.
A. P. Grimanis, D. Zafiropoulos, and M. Vassilaki-Grimani.
Environmental Science and Technology, vol. 12, no. 6, p723-726, 1978. 1 fig., 4 tab., 19 ref.

Descriptors: *Trace elements, *Metals, *Mercury, *Arsenic, *Domestic wastes, Neutron activation analysis, Cadmium, Cobalt, Copper, Lead, Iron, Zinc, Path of pollutants, Municipal wastes, Animal metabolism, Tissue analysis, Bioaccumulation, *Rubidium, *Selenium, *Antimony.

Ten trace elements (As, Cd, Co, Cu, Fe, Hg, Rb, Sb, Se, and Zn) were determined by neutron activation analysis in the flesh and liver of the two edible fishes Sargus annularis and Gobius niger caught from polluted and unpolluted areas of the Aegean Sea. Increased levels of arsenic were found in the flesh of S. annularis from the polluted areas studied. Arsenic levels were also increased in the flesh and liver of G. niger from the Athens sewage outfall area. Elevated concentrations of mercury were fund in the flesh of S. annularis and in the flesh and liver of G. niger from a sea area close to Mytelene Harbor in the island of Lesvos. No significant differences were found for all the other elements determined. Elevated levels or arsenic and mercury found in these two species of edible fish from polluted areas were not high enough to render them dangerous for human consumption. (EIS-Deal)
W78-11697

BEHAVIOR OF DDT, POLYCHLORINATED BIPHENYLS (PCB'S), AND DIELDRIN AT VARIOUS STAGES OF REFINING OF MARINE OILS FOR EDIBLE USE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5C.
W78-11699

UPTAKE OF HYDROCARBONS FROM MARINE SEDIMENTS CONTAMINATED WITH PRUDHOE BAY CRUDE OIL: INFLUENCE OF FEEDING TYPE OF TEST SPECIES AND AVAILABILITY OF POLYCYCLIC AROMATIC HYDROCARBONS,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W78-11702

IMPORTANCE OF SEDIMENT WORKING BY THE DEPOSIT-FEEDING POLYCHAETE ARENICOLA MARINA ON THE WEATHERING RATE OF SEDIMENT-BOUND OIL,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5C.
W78-11703

DISRUPTION OF PRECOPULATORY BEHAVIOR IN THE AMPHIPED ANISOGAMMARUS PUGETTENSIS UPON EXPOSURE TO BLEACHED KRAFT PULPMILL EFFLUENT,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5C.
W78-11707

THE LEVELS OF METALS IN DOCK-YARD SEDIMENTS WITH PARTICULAR REFERENCE TO THE CONTRIBUTIONS FROM SHIP-BOTTOM PAINTS,
University of Manchester Inst. of Science and Technology (England). Pollution Research Unit.
For primary bibliographic entry see Field 5A.
W78-11708

DISTRIBUTION OF NEOPLASMS AND OTHER DISEASES IN MARINE FISHES RELATIVE TO THE DISCHARGE OF WASTE WATER,
Southern California Coastal Water Research Project El Segundo.
For primary bibliographic entry see Field 5C.
W78-11713

PREDICTING EARLY MORNING DISSOLVED OXYGEN CONCENTRATIONS IN CHANNEL CATFISH PONDS,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
C. E. Boyd, R. P. Romaire, and E. Johnston.
Transactions of the American Fisheries Society, Vol. 107, No. 3, p. 484-492, 1978. 6 tab, 5 fig, 17 ref.

Descriptors: *Channel catfish, *Aquiculture, *Dissolved oxygen, Phytoplankton, Respiration, Oxygen demand, *Oxygen sag, Oxygenation, Fish establishment, *Fish farming, Fish hatcheries, Commercial fishing, Methodology.

A computer simulation model for nightime decline in dissolved oxygen (DO) concentrations was developed for channel catfish ponds. This model incorporated data on plankton respiration from the present study, data form the literature on respiration by fish, respiration by organisms in the mud, and O(2) diffusion. The validity of the model was tested for two catfish ponds. Measured and calculated DO concentrations usually agreed within plus or minus 10%. Secchi disk visibility determination should be used in the computer simulation to estimate O(2) consumption by plankton whenever possible. However, COD values may be used when ponds contain appreciable clay turbidity. Series of tables were prepared which the minimum acceptable Secchi disk visibility and the maximum permissible COD when may be tolerated in a particular pond without danger of DO depletion during the night. These tables will be useful to fish pond managers. (EIS-Katz)
W78-11714

THE FATE AND EFFECT OF PETROLEUM IN CONTROLLED ECOSYSTEM ENCLOSURES,
Skidaway Inst. of Oceanography, Savannah, GA.
R. E. Lee, and M. Takahashi.
Rapports et Proces-Verbaux des RReunion, Conseil International Pour L'Explorations de la Mer, Vol. 171, p. 150-156, 1977. 1 tab., 2 fig., 29 ref.

Descriptors: *Oil, *Path of pollutants, *Water pollution effects, *Biological communities, *Phytoplankton, *Zooplankton, *Diatoms, *Degradation(Decomposition), *Primary productivity, *Carbon radioisotopes, Aquatic microorganisms, Productivity, Aquatic bacteria, Chemical analysis, Organic compounds, Chlorophyll, Biomass, Adsorption, Chrysochromulina, Cerataulina, Naphthalene.

Water extracts of No. 2 fuel oil were added to CEPEX enclosures during August, 1974 and June 1975. The approximate initial concentrations of nonvolatile hydrocarbons in 1974 were 10 and 20 micogr/liter in two inclosures. At the lower concentration no major effects on phytoplankton or zooplankton were apparent. The 20 microgr. liter enclosure has a small bloom of a microflagellate and the growth of a labortory culture of this flagellate was stimulated by water extracts of fuel oil. The 1975 experiments had an initial concentration of 40 microgr/liter nonvolative petroleum hydrocarbon which dropped to 20 microgr. liter after 3 days. The losses appreared to be due primarily to microbial degradation and adsorption to sinking particles. The microbial degradation rate of parraffins and low molecular aromatics, but the degradation rate of high molecular weight aromatics such as fluorene and benzprene, increased markedly in the petroleum treated enclosure within one day. Three days after petroleum addition naphthalene degradation rate increased from 0.2 to 2.5 microgr/liter/day. The major changes in populations seen in 1975 after treatment with petroleum were a drastic decline in diatoms followed by a bloom of a microflagellate, which replaced diatoms as the dominant phytoplankter. This in turn was followed by an increase in tintinnids and rotifers, presumably feeding on the microflagellates. The control enclosure was dominated by a diatom, during the course of the experiment (19 days) although for 3 days a small flagellate bloom was also observed. Thus as a result of the addition of fuel oil there was a major change in the ecosystem of the enclosure in term of type of primary and secondary products. (EIS-Katz).
W78-11718

NATURAL SOIL NITRATE: THE CAUSE OF THE NITRATE CONTAMINATION OF GROUND WATER IN RUNNELS COUNTY, TEXAS,
Texas Univ. at Austin. Bureau of Economic Geology.
C. W. Kreitler, and D. C. Jones.
Ground Water, Vol 13, No 1, p. 53-62, Jan.-Feb., 1975. 11 fig, 1 tab, 13 ref.

Descriptors: *Groundwater pollution, *Nitrates, Leaching, *Water pollutant sources, *Path of pollutants.

The ground waters of Runnels County, Texas, are highly contaminated with nitrate. The average nitrate concentration of 230 water samples was 250 mg/1 NO3. The natural variations of the stable nitrogen isotopes N14 and N15 identified natural soil nitrate as the predominant source. Nitrate from animal wastes was of minor importance. The 8 N15 range of natural soil nitrate was +2 to +8 0/00, whereas the 8 N15 range of animal waste nitrate was +10 to + 20 0/00. (Atmospheric nitrogen was used as a standard for mass spectrometric analysis. Experimental error for sample preparation and isotopic analysis was +0/00.) More than 66 percent of the ground-water nitrates analyzed were in the 8 N15 range of natural soil nitrates. Dryland farming since 1900 has caused the oxidation of the organic nitrogen in the soil to nitrate. Minimal fertilizer has been used because of the lack of suitable water for irrigation. During the period 1900-1950, nitrate was leached below the root zone but not to the water table. Extensive terracing after the drought in the early 1950's has raised the water table approximately 6 meters and has leached the nitrate into the ground water. Tritium dates indicate that the ground water is less than 20 years old. (East Central)
W78-11733

ACID PRECIPITATION IN NORWAY: EFFECTS ON AQUATIC FAUNA,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5C.
W78-11737

INSTRUMENTATION FOR BIOLOGICAL MONITORING OF INDUSTRIAL WASTES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W78-11740

DISTRIBUTION OF 1-14C-HEXADECANE IN THE LOBSTER, HOMARUS AMERICANUS, AT

VARIOUS TIMES AFTER INJECTION INTO THE PERICARDIAL SINUS,
National Inst. of Environmental Health Sciences, Research Triangle Park, NC.
H. L. Foureman, P. Hall, and J. R. Bend.
The Bulletin, Mount Desert Island Biological Laboratory, Salsbury Cove, Maine, Vol 16, p. 43-45, 1976. 1 tab.

Descriptors: *Oil, *Oil pollution, Animal behavior, Animal pathology, *Animal physiology, *Lobsters, Commercial shellfish, Crustaceans, Methodology, Radioactivity techniques, Radioisotopes, Path of pollutants, Hepatopancreas, Hexadecane.

In a laboratory study the distribution of hexadecane, a nonvolatile alkane crude oil constituent, in the lobster following intracardial administration, was determined. The hepatopancreas contained higher count ratios of radioactive hexadecane than any other tissue analyzed. The feces appear to be a major sity for excretion of hexadecane and its metabolites. (EIS-Katz)
W78-11741

NEOPLASMS IN ESTUARINE MOLLUSKS AND APPROACHES TO ASCERTAIN CAUSES,
National Marine Fisheries Service, Oxford, MD.
For primary bibliographic entry see Field 5C.
W78-11743

TOXICITY, BOD AND COLOR OF EFFLUENTS FROM NOVEL BLEACHING PROCESSES,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
For primary bibliographic entry see Field 5C.
W78-11782

ASSESSMENT OF MODELS FOR STORM AND COMBINED SEWER MANAGEMENT.
For primary bibliographic entry see Field 5D.
W78-11783

SURVEY OF HUMAN VIRUS OCCURRENCE IN WASTEWATER-RECHARGED GROUNDWATER ON LONG ISLAND,
Brookhaven National Lab., Upton, NY. Dept. of Energy and Environment.
J. M. Vaughn, E. F. Landry, L. J. Baranosky, C. A. Beckwith, and M. C. Dahl.
Applied and Environmental Microbiology, Vol. 36, No. 1, p 47-51, July, 1978. 9 tab, 22 ref.

Descriptors: *Viruses, *Coliforms, *Groundwater recharge, *Recharge ponds, *Aquifers, Isolation, Tertiary treatment, Chlorination, Sampling, Groundwater, Diseases, Water pollution sources, Waste water treatment, Ultimate disposal, Municipal wastes.

Three waste water recharge facilities on Long Island, New York, were monitored in a 1-yr study to assess the transfer of human enteriviruses and coliforms into groundwater. Effluent samples from all three plants were collected monthly and observaton wells were drilled below the recharge sites. Total coliform counts in groundwater near a facility recharging chlorinated trickling filter effluent 30 ft above the aquifer ranged over 15-23,000/100 ml; enterovirus isolation ranged over 0-3.6 plaque-forming units/gal. Viruses isolated in the effluent indluced echo-, coxsackie-, and poliovirus types; the groundwater contaned cchovirus type 12 and other unidentified viruses. Chlorinated effluent was recharged 80 ft above the water table in another facility; groundwater samples yielded no viruses and 4-23,000 coliforms/100 ml. The results indicated that viruses were unable to reach the depth of the aquifer. Total coliforms in groundwater from a facility discharging teritary effluent to a basin 18 ft above the aquifer ranged over 4-930 coliforms/100 ml; virus levels ranged over 0-10.6 plaque-forming units/gal. Viruses isolated in groundwater at this site included echoviruses types 6, 21, 24, 25, and several unidentified types; both vertical penetration and horizontal movement of the viruses through the aquifer were indicated by their presence in the observation well located 50 yds from the recharge site. (Lisk-FIRL)
W78-11785

NITRIFICATION AND OTHER FACTORS AFFECTING NITROGEN IN THE HOLSTON RIVER,
Tennessee Valley Authority, Chattanooga.
For primary bibliographic entry see Field 5C.
W78-11786

COMPUTER CONTROL SYSTEM FOR WATER AND WASTEWATER TREATMENT PLANTS,
Hitachi Ltd. (Japan).
For primary bibliographic entry see Field 7B.
W78-11843

THE TURBULENT TRANSPORT AND BIOLOGICAL STRUCTURE OF EUTROPHICATION MODELS. VOLUME I, PRESERVING THE STATISTICAL STRUCTURE IN LAKE TRANSPORT CALCULATIONS,
Ohio State Univ., Columbus, Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-11863

THE TURBULENT TRANSPORT AND BIOLOGICAL STRUCTURE OF EUTROPHICATION MODELS. VOLUME II, COMPARATIVE STUDY OF THE MATHEMATICAL FORMULATIONS FOR PRIMARY PRODUCTIVITY IN STRATIFIED LAKES,
Ohio State Univ., Columbus, Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-11864

A SIMPLE METHOD TO STUDY PESTICIDE SORPTION IN SOILS AT SHORT TIME INTERVALS,
Central Rice Research Inst., Cuttack (India). Lab. of Soil Microbiology.
P. A. Wahid, and N. Sethunathan.
Soil Science, Vol 126, No 1, p 56-58, July 1978. 2 fig, 1 tab, 4 ref.

Descriptors: *Soils, *Pesticides, *Sorption, Laboratory tests, Aqueous solutions, Radioactivity techniques, Analytical techniques, Filters, Filtration, Chemical analysis, Soil science, Pesticide sorption.

A simple, rapid, and reproducible method which essentially involves filtration, rather than centrifugation, as in the conventional method, for a soil-pesticide solution system uses a hypodermic syringe fitted with a filter paper disc and permits quantification of parathion and gamma-BHC sorbed at extremely short time intervals down to 5 sec. (Sims-ISWS)
W78-11880

GROUNDWATER POLLUTANTS FROM UNDERGROUND COAL GASIFICATION,
Texas Univ. at Austin. Dept. of Civil Engineering.
M. J. Humenick, and C. F. Mattox.
Water Research, Vol 12, No 7, p 463-469, 1978. 9 fig, 4 tab, 12 ref.

Descriptors: *Groundwater, *Pollutants, *Coals, *On-site investigations, Laboratory tests, Gases, Leachate, Ions, Cations, Anions, Organic compounds, Calcium, Sulfates, Ammonia, Water pollution, Water pollution sources, Coal gasification, Ashes.

The purpose of this study was to determine the contaminants released to groundwaters as a result of the underground gasification of lignite and to determine the ability of the surrounding strata to moderate their impact. Groundwater pollutants principally arise from ash leachate and condensed vapors in surrounding strata. Ash was found to yield sulfate, calcium, and hydroxide, while condensed vapors contributed organics and ammonia as major changes to water quality. The organics consisted of mostly polynuclear aromatic hydrocarbons. Phenols were not major organic components. Lignite and clay strata were studied to determine their ability to sorb the groundwater contaminants. Both types of strata were effective in sorbing organics and ammonia. The behavior could be described by Freundlich isotherms. Divalent cations were released by ion exchange with monovalent cations. Anions had little affinity for the strata. Relatively little migration of ammonia and most of the organics was predicted as compared with calcium, sulfate, and some non-sorbable organics. (Sims-ISWS)
W78-11884

OXYGEN AND PH FLUCTUATIONS IN RIVERS,
Technical Univ. of Denmark, Lyngby. Dept. of Sanitary Engineering.
J. F. Simonsen, and P. Harremoes.
Water Research, Vol 12, No 7, p 477-489, 1978. 8 fig, 2 tab, 18 ref.

Descriptors: *Oxygen, *Dissolved oxygen, *Hydrogen ion concentration, *Model studies, Mathematical models, Rivers, Streams, Fluctuations, Diurnal, Seasonal, Solar radiation, Weather, Water quality, Vegetation, Vegetation effects, On-site investigations, *Denmark.

A mathematical model for oxygen fluctuations in a river reach, involving photosynthesis, total community respiration, and reaeration, was presented. Analogy was established between diurnal oxygen fluctuations and diurnal pH-fluctuations. Comparison was made between oxygen production and respiration and carbon dioxide consumption and production. Twin curve analysis of diurnal oxygen fluctuations was made of measurements on a single river reach in Denmark. The measurements were carried out about once a month for a little more than one year. The analysis revealed seasonal variations of the river parameters: total daily gross production of oxygen, total community respiration, and reaeration coefficient. These parameters are important for river modelling. (Sims-ISWS)
W78-11886

LIGNIN OF EFFLUENTS FROM THE SEGEZHA PULP AND PAPER MILL IN NATURAL RESERVOIRS (LIGNIN STOCHNYKH VOD SEGEZHSKOGO TSBK V PRIRODNOM VODOEME),
Adademiya Nauk SSSR, Petrozavodsk. Inst. Lesa.
V. B. Litvinova, and N. F. Komshilov.
Khimiya Drevesiny, No 6, p 85-87, November/December, 1977. 1 fig, 4 ref, 2 tab.

Descriptors: *Lignins, *Water pollution, *Pulp wastes, Pollutant identification, Wastes, Industrial wastes, Water pollution sources, Rivers, Lakes, Sediments, Foreign countries, Colorimetry, Bottom sediments, Surface waters, Waste dilution, Sedimentation, Reservoirs, Segezha River(USSR), Lake Vygozero(USSR), Soviet Union(USSR).

In order to study the behavior of lignin in natural reservoirs more accurately, a seasonal analysis was made of dissolved and precipitated kraft lignin in the Segezha River and Lake Vygozero(USSR). A modified clorimetric method was used for the dissolved lignin, while in the sediment was analyzed by methoxyl group determination. Samples from the surface of the water, mid-depth, and

the bottom were taken at the discharge site and as far away as 16 km from the mill. The lignin content in the lake varied from 80 to 100 mg/liter at the discharge site and from 2.5 to 3.0 mg/liter in open water. The lignin content was higher in winter than in summer. At a distance of 3 km from the mill the lignin content occurred as a result than at the discharge site. Decreases in the lignin content occurred as a result of sedimentation or dilution. The concentration of lignin in the bottom sediments was proportional to the concentration of lignin in the water, and was approximately 8,000 times greater. (Chern-IPC)
W78-11912

AMMONIA DISTRIBUTIONS IN THE SURFACE WATERS OF LIVERPOOL BAY,
University Coll. of North Wales, Menai Bridge. Marine Sciences Labs.
P. Foster, K. B. Pugh, and D. T. E. Hunt.
Estuarine and Coastal Marine Science, Vol 7, No 1, p 71-78, July 1978. 3 fig, 2 tab, 9 ref.

Descriptors: *Ammonia, Water quality, *Nutrients, Surface water, Water pollution, Distribution, *Path of pollutants, Outer Continental Shelf, Wind stress, Seasonal variations, Wales.

Distributions of dissolved ammonia concentrations in the surface waters of Liverpool Bay observed during 6 seasonal cruises in 1975 are presented. A clockwise surface residual circulation, sustained by northerly components of wind stress, led to a marked deterioration in the water quality along the North Wales coast during December, and to a lesser extent in April. In contrast an anticlockwise circulation induced by south to west winds, led to low ammonia concentrations along the North Wales coast and a northerly transport of Mersey effluents along the Lancashire coast during January. During the summer months the ammonia distributions were predominantly biologically rather than physically dependent. (Sinha - OEIS)
W78-11958

A STUDY OF COPPER, LEAD AND CADMIUM SPECIATION IN SOME ESTUARINE AND COASTAL MARINE WATERS,
Australian Atomic Energy Commission, Lucas Heights.
For primary bibliographic entry see Field 2L.
W78-11959

QUANTITATION OF SULFUR CONTAINING OIL COMPOUNDS AND POLYCHLORINATED BIPHENYLS (PCB) IN MARINE SAMPLES,
Osaka Prefecture Inst. of Public Health (Japan). Lab. of Food Chemistry.
For primary bibliographic entry see Field 5A.
W78-11960

DESORPTION OF RADIOACTIVITY FROM NEARSHORE SEDIMENT,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
B. Patel, S. Patel, and S. Pawar.
Estuarine and Coastal Marine Science, Vol 7, No 1, p 49-58, July 1978. 4 fig, 1 tab, 28 ref.

Descriptors: *Sediments, *Harbors, *Radioactivity, *Water pollution, Sorption, Outer Continental Shelf, India, Radionuclides, Desorption, Nearshore sediments.

Cesium-137, cerium-144 and ruthenium-106 discharged into the nearshore environment of the Bombay harbour, have been found to be readily sorbed by the sedimentary particles. On reaching peak sorption levels, however, the levels of all the three radionuclides in the sediment were found to drop exponentially with time (1971-76) under environmental conditions, despite the continued discharged at low levels. From the distribution patterns of radioactivity in the harbour, the rate of decline of 137Cs (the sedimentary half-life) was found to be 1.86 years, significantly lower than its radioactive decay time (30 years). In contrast, those of 144Ce (0.59 year) and 106Ru (0.87 year) were found to be practically the same as their radiological half-lives. The difference between the sedimentary and radiological half-live of both cerium and ruthenium suggests about 20% influx of fresh sediment following monsoon runoff. The effective sedimentary half-life (1.86 years) of 137 Cs was found to be significantly affected by other environmental parameters, in addition to that caused by the influx of fresh material. Of the various environmental factors, salinity was found to affect the desorption of cesium significantly. The possible sorption-desorption mechanicam of cesium, cerium, ruthenium and cobalt radionuclides both under laboratory and field conditions are discussed. (Sinha-OEIS)
W78-11961

ENTRAPMENT OF SUSPENDED MATERIALS IN THE SAN FRANCISCO BAY-DELTA ESTUARY,
Bureau of Reclamation, Sacramento, CA. Water Quality Branch.
For primary bibliographic entry see Field 2L.
W78-11964

BRINE DRAINAGE AND CONVECTION IN YOUNG SEA ICE,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 2C.
W78-11965

THE DYNAMICS OF AN ESTUARY AS A NATURAL ECOSYSTEM,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
For primary bibliographic entry see Field 5C.
W78-11966

HYDROLOGY OF THE NEVIN WETLAND NEAR MADISON, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-11972

WATER-QUALITY CHARACTERISTICS OF THE RED RIVER IN LOUISIANA,
Geological Survey, Baton Rouge, LA. Water Resources Div.
R. F. Martien.
Louisiana Department of Public Works, Baton Rouge, Water Resources Technical Report No 16, 1978. 32 p, 17 fig, 3 tab, 23 ref.

Descriptors: *Water quality, *Louisiana, *Streams, *Path of pollutants, *Water pollution sources, Sewage effluents, Bacteria, Chlorides, Sulfates, Dissolved solids, Heavy metals, Pesticides, Brines, Biochemical oxygen demand, Dissolved oxygen, Phytoplankton, Streamflow, Sediment discharge, Tracking techniques, Tracers, Data collections, *Red River(LA).

The average discharge of the Red River for the period 1928-75 was 24,900 cubic feet per second (cfs) at Shreveport and 31,900 cfs at Alexandria. The mean daily sediment discharge at Alexandria (1964-75) was 103,000 tons per day. Statistical analysis shows a 30-percent reduction in the concentration of dissolved solids, chloride, and sulfate measured at Hosston in the past years. Bacterial pollution is a problem in the entire reach of the river in Louisiana. Dissolved-oxygen concentrations are usually near saturation despite the addition of large amounts of oxygen-consuming wastes. Light-bottle dark-bottle studies revealed that in October 1975, under low-flow conditions, oxygenation due to photosynthesis was about 10 times greater than reaeration due to mechanical diffusion. Water-tracer studies show that when the river is flowing at 6,000 cfs, a spill of 1,000 pounds of contaminant at Shreveport (river mile 270) would have a peak concentration of 117 micrograms per liter when the contaminant reached Coushatta (river mile 219) 50 hours later. (Woodard-USGS)
W78-11979

REGIONAL ANALYSIS OF THE EFFECTS OF LAND USE ON STREAM-WATER QUALITY, METHODOLOGY AND APPLICATION IN THE SUSQUEHANNA RIVER BASIN, PENNSYLVANIA AND NEW YORK,
Geological Survey, Portland, OR. Water Resources Div.
D. J. Lystrom, F. A. Rinella, D. A. Rickert, and L. Zimmermann.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 185. Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 78-12, May 1978. 60 p, 9 fig, 4 tab, 78 ref, 4 append.

Descriptors: *Water quality, *Regional analysis, *Streams, *Pennsylvania, *New York, Water pollution sources, Data collections, Forecasting, Statistical models, Land use, Sediment yield, Water analysis, Dissolved solids, Nitrogen, Phosphorus, Climatic data, Urbanization, Agriculture, Fertilizers, Soil properties, *Susquehanna River basin.

A framework is presented for compiling available data for assessing statistical relationships between water quality and climate, physiography and land use. Seventeen water-quality characteristics studied represent annual mean concentrations or calculated annual yields of suspended sediment, dissolved solids and various chemical species of nitrogen and phosphorus. Usable multiple-linear regressions were developed relating water-quality characteristics to basin characteristics for 14 of the 17 water-quality characteristics with standard errors of estimate ranging from 17 to 75 percent. These models can be used to estimate water quality at specific stream sites or to simulate the generalized effect of land-use characteristics on water quality. For example, observed nitrate yields were up to 20 times greater than the simulated background yields. This increase is indicated to be the result of chemical fertilizers, animal wastes, and urbanization. It was concluded that this was a viable method of assessing the relationships between water quality and basin characteristics on a regional basis. (Woodard-USGS)
W78-11990

DISTRIBUTION OF PHYTOPLANKTON IN SOUTH CAROLINA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-11995

DISTRIBUTION OF PHYTOPLANKTON IN MISSISSIPPI LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-11996

ASSESSMENT OF THE EFFECTS OF NUTRIENT LOADINGS ON LAKE ONTARIO USING A MATHEMATICAL MODEL OF THE PHYTOPLANKTON.
Hydroscience, Inc., Westwood, NJ.
For primary bibliographic entry see Field 5C.
W78-11998

DISTRIBUTION OF PHYTOPLANKTON IN WEST VIRGINIA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-12002

THE TROPHIC STATUS AND PHOSPHORUS LOADINGS OF LAKE CHAMPLAIN,
Vermont Univ., Burlington.
For primary bibliographic entry see Field 5C.
W78-12003

PESTICIDE RUNOFF LOSSES FROM SMALL WATERSHEDS IN GREAT LAKES BASIN,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
B. G. Ellis, A. E. Erickson, A. R. Wolcott, M. Zabik, and R. Leavitt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 084, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/3-77-112, October 1977. 77 p, 8 fig, 24 tab, 5 ref, 1 append. R-800483.

Descriptors: *Pesticides, *Agricultural runoff, *Small watersheds, *Soil erosion, *Model studies, *Soil conservation, *Erosion control, Path of pollutants, Great Lakes, Watersheds(Basins), Agriculture, Cultivation, Sedimentation, Weather patterns, Winter, Soils, Topography, Instrumentation, Operation and maintenance, Methodology, Nonpoint pollution, Paraquat, Leaching, Michigan, Percolation, Ice cover, Snowmelt.

Movement and losses of pesticides were studied May 1973-September 1974 in two small watersheds at Michigan State University, East Lansing, Michigan, as part of an effort to model pesticide transport. Soils, topography, instrumentation, operational procedures, and management are described, and runoff and sedimentation patterns are related to seasonal weather conditions. The study also included a nutrients component, not reported here. Conclusions: (1) Weather sequences preceeding a runoff event can influence or even determine the ratio of runoff to infiltration and percolation. (2) Distribution of surface ice or frost often controls infiltration and deep percolation during winter thaws in the Great Lakes basin. (3) Visible sedimentation patterns are not reliable for determining redistribution of chemicals in runoff. (4) Planter rows, roots, and stubble tend to control runoff direction on short slopes and contribute to impoundment in level areas. (5) Contour planting, no-till, and soil conservation practices are most important for controlling nonpoint pollution from cultivated areas. (6) Pesticide mobility is mainly due to the pesticide's solubility and absorption onto suspended sediments. (7) Paraquat, although cationic, is the most mobile chemical in this study, but its phytotoxicity is destroyed by soil contact. Runoff data for major events in April and August 1975 illustrate effects of crop cover on runoff volumes, sediment yields, and chemical losses. (Lynch-Wisconsin)
W78-12009

EFFECTS OF SOIL MOISTURE ON THE DIFFUSION COEFFICIENTS AND ACTIVATION ENERGIES OF TRITIATED WATER, CHLORIDE, AND METRIBUZIN,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-12013

PROGRAM AND ABSTRACTS: SYMPOSIUM ON NONBIOLOGICAL TRANSPORT AND TRANSFORMATION OF POLLUTANTS ON LAND AND IN WATER.
National Bureau of Standards, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 347, Price codes: A09 in paper copy, A01 in microfiche. Report NBSIR-76-1130, Held May 11-13, 1976. 178 p, 25 tab, 16 fig, 25 ref. Gevantman, L.H., editor.

Descriptors: *Metals, Pollution, *Water pollution effects, *Path of pollutants, *Soils, Soil analysis, Soil chemistry, Soil contamination, Soil contamination effects, Soil environment, *Soil investigations, Soil management, Soil properties, Soil, Types, Soil, Water, Hydrolysis, Adsorption, Water pollution, *Pollutant photochemistry, Mathematical models, Nonbiological transformation, Nonbiological transport, Pollutant photochemistry, *Soil pollution, Solar spectrum.

Program, abstracts and extended abstracts of 21 papers presented at a symposium on nonbiological transport and transformation of pollutants on land and in water are documented. Most of the extended abstracts are detailed and contain figures and references to pertinent literature on the subject matter discussed at the symposium. The subject matter reviewed deals with the physical and chemical behavior of pollutants including pollutant photochemistry, adsorptive behavior of pollutants, hydrolysis, rates of pollutants and mathematical models for documenting pollutant behavior in soils and water. (See W78-12016 thru W78-12032) (EIS-Katz)
W78-12015

HYDROLOGIC TRANSPORT PROCESSES FOR POLLUTANTS IN WATER AND ON SEDIMENTS,
Hydrocomp, Inc., Palo Alto, CA.
N. H. Crawford, and G. Bailey.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and In Water, 1976, p 18-23. 4 fig, 1 ref.

Descriptors: *Hydrologic aspects, Hydrologic data, *Hydrology, *Hydrologic systems, Groundwater, Mathematical models, *Methodology, Sediments, Iowa, Hydrologic cycle, *Hydrologic transport processes, Data requirements.

Hydrologic transport processes are described in both surface and groundwater. The variability of hydrologic transport from point to point in a field, and in different climatic zones is described. The development of computer based models for hydrologic transport is discussed, and the current and expected future applications of these models are outlined. The data requirements for analysis of hydrologic transport are discussed. (See also W78-12015) (EIS-Katz)
W78-12016

THE PHOTOCHEMISTRY OF XENOBIOTICS,
California Univ., Davis.
D. G. Crosby.
In: Symposium on Nonbiological Transport and Transformation of Pollutants On Land and In Water, May 1976, p 24-27. 7 fig, 13 ref.

Descriptors: *Herbicides, Water pollution sources, *Water pollution effects, Water treatment, *Degradation, *Light, Light intensity, *Light quality, Environmental effects, Oxidation, Reduction, Hydrogen ion concentration, Xenobiotics, *Photosensitivity.

For centuries, chemists have observed the effects of light on chemicals in the laboratory. However, it is only recently that investigation has extended to the sunlight-mediated transformations of foreign compounds - xenobiotics - under environmental conditions. Several characteristic reaction types now are recognized including oxidation, reduction, photonucleophilic displacements, elimination, and isomerization. In addition to the chemical properties of the xenobiotic, the chemical nature of the surrounding microenvironment is an important determinant of its environmental fate. pH and photosensitizers in aquatic environments, interaction with air- and water-borne particles, and atmospheric composition all exert significant influence under laboratory conditions, but more emphasis on field investigations is needed. (See also W78-12015) (EIS-Katz)
W78-12017

VERTICAL MOVEMENT AND DISTRIBUTION OF ORGANICS IN SOILS,
Florida Univ., Gainesville. Dept. of Soil Science.
J. M. Davidson.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p 28-31. 1 fig, 17 ref.

Descriptors: *Soils, *Soil analysis, Soil chemical properties, Soil classification, *Soil contamination, *Soil environment, Soil microbiology, Soil water, Soil temperature, Chromatography, Adsorption, *Organic solutes, Solute mobility, Solute distribution, Adsorption-desorption.

The mobility and distribution of organic solutes in soils are dependent upon the physical and chemical characteristics of the soil, microbial degradation rate, and interactions between the solute and soil matrix. Chromatography theory has been used to describe solute movement and concentration distributions in soils. The adsorption-desorption of an organic solute in a soil-water system has been shown to follow a Freundlich equation. The velocity at which an adsorbed solute moves through soil is independent of solute concentration for linear adsorption isotherms (N-1) and concentration dependent for nonlinear adsorption isotherms (1.0 less than N less than 1.0). Adsorbed solutes have greater velocities at high solute concentrations (C greater than 1.0 microgr/cm3) when N is less than 1.0. The concentration distribution of an adsorption isotherm is nonlinear (N less than 1.0). The microbial degradation rate and solute velocity determine the depth to which an adsorbed solute front or pulse will move. (See also W78-12015) (EIS-Katz)
W78-12018

PATTERNS OF DEPOSITION OF RADIONUCLIDES IN SEDIMENTS,
Argonne National Lab., IL.
D. N. Edgington, and J. A. Robbins.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p 32-38. 2 tab, 8 fig, 16 ref.

Descriptors: *Lake Michigan, *Sediments, *Sedimentation, *Radioactivity, Methodology, Radiochemical analysis, Radioecology, Sediment distribution, Sediment load, Sediment transport, Sedimentation rates, *Lead, Concentration profiles, Southern Lake Michigan, *137Cs, *210Pb, *239,240Pu.

Concentration profiles of 137Cs, 210Pb, and 239,240Pu have been measured in sediment cores taken mainly from the southern end of Lake Michigan. Their measurement provides an accurate method for determining the rate of accumulation of sediments. The results indicate that the rate of accumulation of sediments in the lake is highly variable. They also indicate that there is a general redistribution of radioactivity in surface sediments from areas where there has been no significant deposition during the last 7000 years to areas where there is considerable sedimentation. Mechanisms such as these will be important in terms of understanding the effects of long-term fate of radionuclides (and other heavy metals) discharged into the lake. The differences in the shapes of the various profiles can be explained in terms of a constant (210Pb) or a variable (137Cs, 239,240Pu) flux to the air-water interface with time, sedimentation rate, homogenous mixing due to physical or biological processes, and massive erosion or deposition due to storm activity. (See also W78-12015) (EIS-Katz)
W78-12019

REACTION RATES OF ELECTRON PAIR DONOR MOLECULES WITH POLLUTANTS IN WATER,
Brown Univ., Providence, RI. Dept. of Chemistry.
J. O. Edwards.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976. p. 45-47, 14 ref.

Descriptors: *Water pollution, *Water pollution effects, *Path of pollutants, Insecticides, *Organophosphorus pesticides, Toxicity, *Chemical degradation, Chemical reaction, Organic compounds, Donor reactions, Electron pair donor molecules, Electrode potential.

Many pollutants (including phosphorus insecticides and sulfur dioxide) react with electron pair donors (also termed nuclophiles, and in most instances these are reductants) to form new compounds less harmful to living systems and to the environment. For example, the anticholinesterases are converted to different chemical compounds which are not poisonous although there remains an oxygen demand in the organo-phosphorus product. A general introduction into the chemistry of donors' interactions with substrates will be presented along with some aspects of reaction mechanism. The relative rates of donor reactions with several varieties of organic compounds, tetrahedral phosphorus species, compounds with cyano-groups, and metal complexes will be presented. Correlations of donor reactivity with basicity, electrode potential, polarizability, bonding nature, and the 'alpha-effect' will be discussed on an empirical basis. Some generalizations that may be used for prediction of rates with new systems are now possible. The importance and value of hydrogen peroxide for treatment of polluted water will be detailed. (See also W78-12015) (EIS-Katz)
W78-12020

CHEMICAL DEGRADATION OF ORGANIC POLLUTANTS IN SOIL,
Oregon State Univ., Corvallis.
V. H. Freed.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p. 55-56. 2 fig.

Descriptors: *Pesticide kinetics, *Pesticide removal, Pesticides, Organic pesticides, Organic compounds, *Chemical degradation, Chemical reaction, Chemical wastes, Enzymes, Oxidation, Reduction, Hydrolysis, Hydrogen ion concentration, Catalysts, Clays, *Soil, Soil chemistry.

A number of reaction paths for organic pollutants in soil is theoretically possible. They may be categoriezed in the two major groups, namely biologically (including extracellular enzyme) mediated reactions, and 'chemical' reactions. The focus of this presentation is on chemical or nonbiological reactions exclusive of the oxidation-reduction reactions. These include such things as hydrolysis, complexation, and physical interactions. Much of the work on degradation of organic pollutants in soil has focused on pesticides. Since these compounds represent a number of classes of organic chemicals, they serve quite adequately as models for many of the organic pollutants. For many compounds, e.g. esters, amides, halogen substituted open-chain compounds, and others subject to nucleophilic attack, hydrolysis is much more rapid in soil than in aqueous solution. This has been attributed to catalytic influences of clay and organic matter, alkaline and aldaline earth ionic species, and overally pH. Other reactions leading to chemical degradation include complexation with some of the transition elements or sorption at specific loci on clay surfaces. (See also W78-12015) (EIS-Katz)
W78-12021

ADSORPTION AND TRANSPORT OF POLLUTANTS ON SUSPENDED PARTICLES,
Bedford Inst. of Oceanography Dartmouth (Nova Scotia). Marine Ecology Lab.
B. T. Hargrave, and K. Kranck.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p. 68-78. 1 tab, 3 fig, 38 ref.

Descriptors: *Adsorption, *Sediments, *Suspended load, *Suspended solids, Pollutants, Water pollution effects, Path of pollutants, Solubility, Environmental effects, Organic pesticides, *Desorptive hydrocarbons, *Flocculation processes, Transport processes.

Many pollutants entering water, particularly those of low solubility, become associated with natural suspended material. Particle size and concentration detemine the surface area available for adsorption and flocculation into units determined by inorganic grain size. Prediction of transport and dispersal of many aquatic pollutants is thus equivalent to prediction of the dynamics of fine-grained suspended material. (See also W78-12015) (EIS-Katz)
W78-12022

PHOTOLYSIS OF PESTICIDES ON SOIL SURFACES,
Georgia Univ., Savannah. Dept. of Chemistry.
R. Hautala.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p. 79-83. 4 tab, 1 fig, 3 ref.

Descriptors: *Pesticides, *Insecticides, *Herbicides, Detergents, *Soils, Soil chemistry, Surfactants, Soil surfaces, *Degradation(Decomposition), Soil water, Soil types, Organophosphorus insecticides, *Sevin, *Parathion, *2,4-D, Anionic detergents, Cationic detergents, Photolysis, Photodecomposition.

We have examined the photochemical decomposition of Sevin, Parathion, and 2,4-D on three different types of soil surfaces. The effects of anionic and cationic surfactant additives on the 'rates' of photodecomposition have been studied. The moisture content of the soils' was found to be a critical variable. Crude estimates of the quantum efficiency for photodecomposition indicate that photochemistry in aqueous solution for all cases, but the variables described above exert strikingly different effects for each of the pesticides. (See also W78-12015) (EIS-Katz)
W78-12023

PREDICTIVE MODELING OF THE BEHAVIOR OF POLLUTANTS IN THE AQUATIC ENVIRONMENT,
Environmental Research Lab., Athens, GA.
R. R. Lassiter, G. L. Baughman, and J. L. Malachuk.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p. 85-98. 8 fig, 6 ref.

Descriptors: Metals, *Mercury, Water pollution effects, *Path of pollutants, Modeling, Environmental effects, *Sediments, Laboratory tests, Methodology, Sorption, Volatility, Suspended solids, *Aquatic environment, *Methyl mercury, Evaluative models, Suspended particulates, Metallic mercury.

A prototype model was constructed to classify the behavior and fate of substances with respect to specified environment conditions, and to evaluate factors and processes important in their behavior and fate. Such models can be called evaluative models. The substance chosen for the prototype was mercury. Forms of mercury represented are mercuric, elemental, and methyl mercury. These forms are assumed to exist in both water and sediment. The water is assumed to be moving over stationary sediments. Factors represented which potentially affect the fate of mercury are flow, water, and sediment depths, suspended particulates, and hydrogen ion concentration. Sorption and volatilization were found to be important processes affecting the fate of mercury as protrayed by the model. The need for measurement of parameters such as the partion coefficient for mercury forms bound to sediments is stressed. (See also W78-12015) (EIS-Katz)
W78-12024

PREDICTION OF SOLUBILIZATION OF HYDROPHOBIC ORGANIC COMPOUNDS IN WATER,
Pomona Coll., Claremont, CA.
A. J. Leo.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p. 99-109, 1 tab, 5 fig, 15 ref.

Descriptors: Pollutants, *Path of polutants, Water chemistry, *Solubility, Solutes, *Solvation, Environment, Lipids, Adsorption, *Molecular structure, mathematical modeling, *Partition coefficient, Availability, *Alkane solutes, Environmental subsystems, Hydrophobic organic compounds.

The mechanisms by which organic chemicals are dispersed into the environment as pollutants need a great deal of further study. In all environmental subsystems - land, atmosphere, inland waterways, or oceans - water appears to be a major carrier so a pollutants water solubility and the manner in which it partitions between water and some lipid phase are important parameters to consider when constructing model systems and establishing quantitative relationships. The partition coefficient P may have greater significance in these studies than water solubility per se. For organic liquids, the solution process can be considered as one of self-partioning. Normally, most organic solids do not become pollutants until they become dissolved. Once this has occurred, they are rarely removed from solution by recrystallization but their availability and mobility may be altered by adsorption to a surface or by solution in an immisible phase. These latter occurrences can often be modeled by use of the compounds' partition coefficient between octanol/water. The theoretical basis for the partitioning process is discussed and methods by which the log P(oct) can be predicted from molecular structures are given. (See also W78-12015) (EIS-Katz)
W78-12025

THE ENVIRONMENTAL PHOTODEGRADATION OF SELECTED ORGANOMETALIC COMPLEXES,
Eastman Kodak Co., Rochester, NY. Health, Safety and Human Factors Lab.
For primary bibliographic entry see Field 5C.
W78-12026

KINETICS OF HYDROLYSIS AND OXIDATION OF ORGANIC POLLUTANTS IN THE AQUATIC ENVIRONMENT,
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5C.
W78-12027

PREDICTION OF VOLATILIZATION RATE OF POLLUTANTS IN AQUEOUS SYSTEMS,
Toronto Univ. (Ontario). Dept. of Chemical Engineering and Applied Chemistry.
For primary bibliographic entry see Field 5C.
W78-12028

COMPLEXATION, PRECIPITATION AND ADSORPTION OF TRACE METALS IN WATER,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Environmental Engineering Science.
J. J. Morgan, and J. Vuceta.

In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p. 130-135. 20 ref.

Descriptors: *Metals, *Hydrogen ion concentration, Trace elements, Water quality, Water pollution effects, *Adsorption, *Acid base equilibrium, Mathematical models, Water temperature, Silica, *Copper, *Cadmium, *Zinc, *Nickel, *Lead, Precipitation, *Chelating agents, EDTA, *Complexation, Complexing ligands, Redox, Surface complex formation.

Metals introduced to natural waters are removed by precipitation, adsorption, and incorporation into biotic matter. Distributions of various metals between particulate and aqueous phases depend upon: pH, chemical and physical properties of different adsorbing surfaces, nature and abundance of complexing ligands in the solution phase, competition between metals for available ligands and surface sites, ionic strength of the redox environment, and temperature. Predictive models must simulataneously consider all significant acid-base, solubility, complexation, redox, and adsorption processes. Adsorption models are briefly considered with respect to their treatment of chemical and electrostatic influences on metal ion distributions. Two models, the adsorption-hydrolysis, ion-solvent (AHIS) interaction model and the surface complex formation (SCF) model are considered in detail and applied to the description of complex the influence of other solution composition variables on the distribution coefficient is examined. Three equilibrium multimetal, multi-ligand system models are presented in which either AHIS or SCF descriptions of adsorption are employed. These systems models illustrate quantitatively the influences of pH, surface area, organic ligands, and precipitation processes on trace-metal distributions in water. (See also W78-12015) (EIS-Katz)
W78-12029

ENVIRONMENTAL PHYSICS AND CHEMISTRY OF AQUATIC POLLUTANTS,
Harvard Univ., Cambridge, MA. Div. of Engineering and Applied Physics.
J. C. Morris.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p. 136-141. 25 ref.

Descriptors: Pollutants, Water pollution effects, Path of pollutants, Precipitation, Adsorption, Physical chemistry, Water quality, *Oxidation, Polychlorinated biphenyls, *Oxidation, *Hydrolysis, *Photolysis, *Catalyzed oxidation, *Volatilization.

For those aquatic pollutants that are not readily oxidized or degraded biologically the ultimate fates are determined by their physical and chemical properties in the aqueous medium. Some physical properties of significance are volatility, aqueous solubility, and adsorptive tendency, for these determine the likelihood that a pollutant will translocate into the air or the sediments. The chemical transformations by which organic pollutants are removed are generally either hydrolytic or oxidative, so that the susceptibilities of pollutants to hydrolysis or oxidation are chemical properties of major interest. Oxidation, in particular, may be either direct reaction with 02, catalyzed oxidation, photooxidation or photosensitized oxidation. (See also W78-12015) (EIS-Katz)
W78-12030

OXIDATION AND REDUCTION OF PESTICIDES IN SOILS AND SEDIMENTS,
Department of Agriculture Beltsville, MD.
For primary bibliographic entry see Field 5C.
W78-12032

EFFECT OF STRIP MINING ON WATER QUALITY IN SMALL STREAMS IN EASTERN KENTUCKY, 1967-1975,
Northeastern Forest Experiment Station, Berea, KY.
K. L. Dyer, and W. R. Curtis.
Research Paper NE-372, 1977. 13 p, 8 fig, 2 tab, 12 ref.

Descriptors: *Strip mines, *Water quality, *Streams, Water chemistry, Appalachian Mountain region.

Eight years of streamflow data are analyzed to show the effects of strip mining on chemical quality of water in six first-order streams in Breathitt County, Kentucky. All these watersheds were unmined in August, 1967, but five have since been strip mining causes large increases in the concentration of most major dissolved constituents in the runoff waters, the concentration of most of these reaching a maximum some time after mining has ceased, then holding steady for several years. The maximum concentration of dissolved salts occurred during the low flow of the dormant season, whereas maximum salt loads occurred during the high flow of the early part of the growing season. (Forest Service)
W78-12035

LEAST-SQUARES ESTIMATOR FOR POLLUTED STREAM VARIABLES IN A DISTRIBUTED PARAMETER MODEL,
Tampere Univ. of Tech. (Finland).
H. N. Koivo, and A. J. Koivo.
Advances in Water Resources, Vol 1, No 4, p 191-194, June 1978. 1 fig, 10 ref.

Descriptors: *Least squares method, *Streams, *Water pollution, *Simulation analysis, Dissolved oxygen, Biological oxygen demand, Streeter-Phelps model, Computer models, Equations, Systems analysis.

An optimal estimator is constructed to determine the concentrations of dissolved oxygen and biological oxygen demand. The mathematical model used is a set of modified Streeter-Phelps equations specified by partial differential equations. The noise-corrupted measurements of the dissolved oxygen concentration are continuous in time but discrete in space. The optimal estimation is obtained by the application of the innovations approach. The resulting estimator equations (partial differential equations) are presented and their solution discussed. The solution presented provides a more direct derivation of the estimator. The choice of computational solution depends on the computer available; hybrid computers are advantageous in solving partial differential equations. (Bell-Cornell)
W78-12042

MODELING SEWER FLOWS USING TIME SERIES ANALYSIS,
Texas Univ. at Austin. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5D.
W78-12051

ANIMAL WASTES AND NON-POINT POLLUTION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-12053

RUNOFF AS A FACTOR IN EUTROPHICATION OF SURFACE WATERS IN RELATION TO PHOSPHORUS MANURING,
Institute for Soil Fertility, Groningen (Netherlands).
For primary bibliographic entry see Field 5E.
W78-12056

PHOSPHORUS COMPOUNDS IN PIG SLURRY AND THEIR RETENTION IN THE SOIL,
Institute for Soil Fertility, Groningen (Netherlands).
For primary bibliographic entry see Field 5E.
W78-12057

WATER POLLUTION BY LIVESTOCK EFFLUENTS,
Institut de Recherches Chimques; Tervuren (Belgium).
R. De Borger, and K. Meeus-Verdinne.
Utilization of Manure by Land Spreading, A Seminar in the EEC Programme of Co-ordination of Research on Effluents, organized by the 'Instituo Sperimentale Agronomico,' Modena, Italy, Sept. 20-24, 1976, p. 313-328. (1976), 4 fig, 5 tab, 5 ref.

Descriptors: Water pollution sources, Eutrophication, Nutrients, Belgium, Farm wastes, *River Ijzer(Belgium), Fish kills, *Livestock wastes, Direct discharge, Land spreading.

About 20 years ago the River Ijzer was a healthy river abounding in fish. In the last few years, fish mortality has recurred frequently. Entering Belgium from France, where it covers 37 of the 78 km of its course, the River Ijzer flows slowly through a predominantly agricultural, sparsely populated (180 inhabitants/km2), poorly industrialized region, the altitude of which does not exceed 5 m. Though the exact contribution of livestock breeding farms have a significant influence on the eutrophication of the River. While the problem of eutrophication of rivers flowing through a mainly agricultural region cannot be solved immediately, direct discharging of livestock effluents in surface waters cannot be allowed. Of the 2 solutions offered (a waste water treatment plant or land-spreading of livestock effluents), only land spreading seemed acceptable. Expense, location selection, and inefficiency made waste water treatment impractical. While land spreading seems to be the answer, even this solution may have its problems. The direct influence on the soil, the crops and indirectly on the surface water through runoff and infiltration cannot yet be foreseen. (Merryman - East Central)
W78-12058

OPTIMIZATION OF RUNOFF DETENTION FOR NONPOINT POLLUTION CONTROL,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-12064

PRELIMINARY IDENTIFICATION OF LITERATURE MODELS AND DATA FOR EVALUATING RURAL NONPOINT NUTRIENT, SEDIMENT, AND PATHOGEN SOURCES,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-12069

ANALYSIS OF RUNOFF FROM SOUTHERN GREAT PLAINS FEEDLOTS,
Southwestern Great Plains Research Center, Bushland, TX.
R. N. Clark, A. D. Schneider, and B. A. Stewart.
Transactions of the ASAE, Vol. 18, No. 2, p 319-322, March-April, 1975. 6 fig, 7 ref.

Descriptors: *Feedlots, *Agricultural runoff, Salts, Irrigation, Playas, Watersheds(Basins), Water quality, *Farm wastes, Pollutant identification, *Great Plains, Holding ponds.

Runoff amounts and chemical quality have been measured from a Southern Great Plains cattle feedlot at Bushland, Texas. The rainfall-runoff relationship for runoff-producing storms was

linear, with about one-third of the rainfall in excess of 10 mm ending up as runoff. Other researchers in the Great Plains obtained similar results except that the amount of rainfall ending up as runoff was lower at Bushland. Concentrations of various runoff constitutents were higher than those found for cattle feedlots elsewhere. Low rainfall, high evaporation rates, and high stocking rates cause the manure pack in the feedlots to contain more salts, thus allowing increased concentrations in runoff. A dilution ratio of about five parts well water to one part feedlot runoff would reduce the salinity hazard for irrigation from very high to medium for most holding ponds in the Southern Great Plains. Runoff caught in playas where the area of the feedlot is one-fifth or less of the total watershed area could be considered as having a low or medium salinity hazard. Any use of feedlot runoff for irrigation requires close watch on salts in the water and soil. (East Central Univ)
W78-12075

NITRATE POLLUTION OF GROUNDWATER FROM NITROGEN FERTILIZERS AND ANIMAL WASTES IN THE PUNJAB, INDIA,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
B. Singh, and G. S. Sekhon.
Agriculture and Environment, Vol. 3, No. 1, p 57-67, Dec., 1976. 4 fig, 2 tab, 15 ref.

Descriptors: *Nitrates, Fertilizers, *Farm wastes, Sampling, Electrical conductivity, *Groundwater pollution, *India.

An investigation was made of the effect of N-fertilization on nitrate concentration in soil and groundwater under cultivated areas of the Ludhiana district where N-application rates are the highest in the Punjab (India). Water samples were collected from 57 wells and analyzed for nitrates. Nitrate content of well water near villages was significantly higher than in the cultivated areas. The major contributor to high nitrate levels in the groundwater under villages appeared to be animal wastes. Although farm-yard manure is added along with chemical fertilizers in the cultivated areas, crop plants absorb most of the applied nutrients from both of these sources, leaving only a small amount which can be leached beyond the potential rooting zone. However, while nitrate content was markedly higher in groundwater near villages, the mean electrical conductivity of the groundwater was only slightly higher than under cultivation. Both arithemtic and geometric means increased slightly in the villages just after the monsoon season, but no significant increase was observed in the cultivated areas. These observations indicated that groundwater in the study area was recharged during the rainy season and that salts were leached to the water table. These data indirectly confirm the role of animal wastes in increasing the nitrate concentration of well water near the villages. It is felt that in cultivated areas, nitrate concentration of well water is not now in equilibrium with present day agriculture. If that is so, a mean (geometric) nitrate concentration as high as 35 ppm in groundwater can be expected in future years. These hypotheses can only be confirmed by further investigations. (Rowe-East Central)
W78-12076

NITROGEN MOVEMENT NEAR SURFACE MANURE STORAGES,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 5G.
W78-12080

WATER QUALITY AND THE FARM POND,
Department of Agriculture, Lethbridge (Alberta).
For primary bibliographic entry see Field 5G.
W78-12082

CONCEPTUAL MODELLING OF NONPOINT SOURCE POLLUTION FROM LAND AREAS RECEIVING ANIMAL WASTES: I. NITROGEN TRANSFORMATIONS,
North Carolina State Univ. at Raleigh.
K. R. Reddy, R. Khaleel, M. R. Overcash, and P. W. Westerman.
Paper No. 77-4046, Presented at American Society of Agricultural Engineers, 1977 Summer Meeting, North Carolina State University, June 26-29, 1977, 43 p, 12 fig, 6 tab, 57 ref.

Descriptors: *Model studies, *Agricultural runoff, *Water pollution sources, Waste disposal, *Land application, *Nonpoint pollution, Nitrogen transformations, Poultry wastes, Swine wastes, Cattle wastes, Volatilization.

Pollution of lakes and streams through surface runoff from land areas receiving animal wastes are considered as one major nonpoint source pollution. N as a pollutant from these areas is discussed. The objective of the conceptual modelling was to describe the availability of N compounds in the surface soil layers of soil-manure system between rainfall events, during the rainfall event, and N species to be transported in the surface runoff. Emphasis was placed on the effect of N transformation (major ones considered were mineralization of organic N and NH3 volatilization in the soil manure system) on the availability of N compounds at the soil surfaces. The model presented is based on a state-of-the-art approach, which describes the transformations and transport of the N compounds during the rainfall events and between the rainfall events. The model considers the C/N ratio approach to describe the availability of the potentially mineralizable N in different manures. From the results presented it can be concluded that 50% of the potentially mineralizable N present in the poultry and swine manures after the application to the soil, is made available (converted to inorganic forms) during first 3 weeks after application, whereas it took 4 months after application of beef manure to decompose 50% of the potentially mineralizable nitrogen. Manures were also characterized based on their initial ammonium N concentration. At least 90% of ammonium N initially present in manures is lost through volatilization during first week after application. The factors influencing these two processes, namely, mineralization of organic N and NH3 volatilization were also presented. (Reddy-North Carolina State University)
W78-12083

CHARACTERIZATION AND TREATMENT OF WASTE DISCHARGED FROM HIGH DENSITY CATFISH CULTURES,
Tennessee Valley Authority, Chattanooga. Div. of Environmental Planning.
For primary bibliographic entry see Field 5D.
W78-12086

ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-12090

MODELING PESTICIDES AND NUTRIENTS ON AGRICULTURAL LANDS,
Hydrocomp, Inc., Palo Alto, CA.
A. S. Donigian, Jr., and N. H. Crawford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 566, Price codes: A15 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-76-043, Feb. 1976, 318 p. 52 fig, 36 tab, 54 ref.

Descriptors: Watersheds(Basins), *Agricultural runoff, Nitrogen, Phosphorus, *Pesticides, *Path of pollutants, *Model studies, *Nutrients, Agricultural Runoff Management Model, Hydrologic modeling, Simulation analysis, Soil erosion.

Modifications, testing, and further development of the Pesticide Transport and Runoff (PTR) Model have produced the Agricultural Runoff Management (ARM) Model. The ARM Model simulates runoff, snow accumulation and melt, sediment loss, pesticide-soil interactions, and soil nutrient transformations on small agricultural watersheds. Major modifications to and differences between the PTR and ARM Models are discussed. An energy-balance method of snow simulation, and a first-order transformation approach to nutrient modeling are included. Due to lack of data, the nutrient model was not tested with observed data; testing and refinement are expected to begin in the near future. Instrumented watersheds in Georgia provided data for testing and refinement of the runoff, sediment and pesticide portions of the ARM Model. Comparison of simulated and recorded values indicated good agreement for runoff and sediment loss, and fair to good agreement for pesticide loss. Pesticides transported only by sediment particles were simulated considerably better than pesticides that move both in solution and on sediment. A sensitivity analysis of the ARM Model parameters demonstrated that soil moisture and infiltration, land surface sediment transport, pesticide-soil interactions, and pesticide degradation are the critical mechanisms in simulating pesticide loss from agricultural watersheds. (East Central)
W78-12094

NITRATES IN THE UPPER SANTA ANA RIVER BASIN IN RELATION TO GROUNDWATER POLLUTION.
California Agricultural Experiment Station, Bulletin 861, 1973, 59 p. 30 fig, 20 tab, 112 ref. R. S. Ayers and R. L. Branson, editors.

Descriptors: *Groundwater pollution, *Nitrates, Public health, Pollutants, Fertilizers, Water pollution, *Agricultural runoff, Leaching, *Farm wastes, *Santa Ana River Basin(Calif), California.

The extensive groundwater supplies in the Santa Ana Basin constitute a valuable resource which must be protected from excessive degradation if long-term beneficial use is to be realized. Nitrate in some of the Basin's well waters is already in excess of drinking-water standards of the U.S. Public Health Service. A 3-month study was made of the nitrate problem in the Basin. The study was restricted for the most part to the Upper Basin (above Prado Dam), where preliminary work indicated that nitrate degradation of waters was most serious. A multidisciplinary approach was used for analyzing problem areas of high nitrate concentrations in the groundwaters, determining the probable cause of each problem area (agricultural fertilizers, manure disposal, wastewater disposal, etc.), and developing recommendations for prevention of future problems of a similar nature in the watershed. University staff involved in this study represented the fields of surface and groundwater hydrology, soil and water chemistry, soil microbiology, sanitary and agricultural engineering, water science, and plant science. Special objectives included: a review of available data in order to identify and quantify existing high nitrate concentrations in groundwater; a review of the history of land and water use, waste disposal, and other practices in each problem area to form judgements on causes of high nitrate concentrations; development of guidelines for rates of fertilization, water application, and animal waste disposal which will appreciably reduce the potential for nitrogen pollution of surface and groundwaters of the Basin consistent with reasonable levels of agricultural production; identification of areas of potential pollution related to nitrogen but not of primary concern in this study; and identification of problems needing further study. (East Central Univ)
W78-12096

DISTRIBUTION OF PHYTOPLANKTON IN MARYLAND LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-12100

5C. Effects Of Pollution

INTERACTING ENVIRONMENTAL FACTORS WHICH CONTROL THE SINKING RATE OF PLANKTONIC ALGAE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
D. L. King, and M. T. Hill.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 070, Price codes: A03 in paper copy, A01 in microfiche. Completion Report July, 1978. 40 p, 12 fig, 1 tab, 35 ref, append. OWRT A-090-MICH(1), 14-31-0001-7048.

Descriptors: *Algae, *Light, *Alkalinity, Carbon dioxide, Sinking rate(Algae), Growth rates, Biomass, Bioassay, Eutrophication, Lakes, Sewage lagoons, Aquiculture, *Chlorella.

Light and carbon dioxide limits interact in a multiplicative fashion to control the specific growth rate, the specific sink rate and the specific plankton biomass accumulation rate of Chlorella vulgaris. Ug decreases, Us increases and Uab decreases as functions of increased stress on the alga induced by interactions between carbon and light. The effect of the decrease in Uab as a function of the interacting limits is to limit the ability of Chlorella vulgaris to compete in natural systems at free carbon dioxide concentrations three orders of magnitude greater than those required to sustain photosynthetic carbon fixation. This suggests that application of results from chemostat studies of plankton algal kinetic response to environmental limits incorporates a significant error associated with the sinking of algae in natural systems. Application of these results to algal bioassays, lake eutrophication, sewage lagoons and aquaculture are discussed.
W78-11365

CHARACTERIZATION OF NUTRIENTS AND ALGAL BLOOMS AT ABIQUIU AND COCHITI RESERVOIRS,
New Mexico Univ., Albuquerque. Dept. of Biology.
L. L. Barton, and G. V. Johnson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 144, Price codes: A06 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No. 094, May 1978, 105 p, 18 fig, 40 tab., 19 ref. OWRT A-058-NMEX (1), 14-34-0001-7066.

Descriptors: Reservoirs, *Eutrophication, *Cyanophyta, *Nutrients, Mesotrophy, Primary productivity, Water pollution effects, *Algae, *Bioassay, Pollutant identification, Nutrient concentrations, *New Mexico, Cochiti Reservoir(N Mex), Abiquiu Reservoir(N Mex), *Anabeana, *Aphanizomenon.

The objective was to characterize the proliferation of algae in Abiquiu Cochiti Reservoirs by determining the chemical characteristics and the limnological conditions prior to, during, and following algal blooms as well as throughout the year. Microbial studies were employed to determine the possible health hazards due to contamination from human sewage. A bloom of blue-green algae of nuisance proportions occurred at Cochiti Reservoir in the summer of 1976. The bloom was characterized as predominately Aphanizomenon with a smaller biomass of Anabaena. Bioassays of extracts prepared from this Aphanizome bloom indicated that the bloom was toxic to vertebrate organisms. In the summer of 1977 in surface bloom of Aphanizomenon was reducted by an oder of magnitude and Anabeaena was approximately equal in abundance to Aphanizomenon. Because of increased light penetration and enhanced photosynthetic activity at greater depths, phytoplankton primary productivity decreased only to half the 1976 values. The decrease in blue-green algae in 1977 was associated with lower levels of total nitrogen and phosphorus in reservoir water. Cochiti Reservoir was characterized as eutrophic in the summer of 1976 and mesotrophic in 1977. At Abiquiu Reservoir the blue-green algal population and primary productivity was considerably lower than at Cohiti Reservoir. In the summer of 1976 Aphanizomenon was abundant in algal samples while Anabeaena was rarely observed. In 1977 smaller populations of Aphanizomenon occurred with an increased diversity of diatoms and green algae. Primary productivity and nutrient concentrations in Abiquiu Reservoir were characteristic of mesotrophic conditions in 1976-77. (Stockton-N Mex SN).
W78-11367

MODELING PHOSPHORUS CYCLING IN LAKE SEBASTICOOK NEWPORT, MAINE,
Maine Univ. at Orono. Dept. of Mathematics.
T. A. Hannula.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 066, Price codes: A06 in paper copy, A01 in microfiche. Land and Water Resources Institute, Orono, Completion Report, June 1975. 96 p, 44 fig, 8 tab, 10 ref, 2 append. OWRT A-039-ME(1).

Descriptors: Drawdown, Input-output analysis, Lakes, *Phosphorus, Lake sediments, *Computer models, *Simulation analysis, Eutrophication, Maine, *Lake Sebasticook(ME), Anaerobic conditions, Hypolimnetic discharge, *Model studies.

A computer simulation model to investigate the internal cycling of phosphorus has been constructed for Lake Sebasticook, a shallow eutrophic lake in central Maine. The model divides the lake into 'n' uniformly mixed horizontal layers and superimposes a time-varying anaerobic zone on the layer structure. Using seasonally varing rate coefficients for sedimentation losses, eddy diffusion, external hydraulic and phosphorus loading, and phosphorus release from aerobic and anaerobic sediments, the model produces phosphorus profiles similar to those observed in Lake Sebasticook. Lake Sebasticook has a peak phosphorus content of 9500 kg in September due to the apparent release of 6000 - 9000 kg p from the sediments during the summer. Model runs suggest that the reduction of the external P loading by 45% to about 5000 kg/year through removal of the known point sources will have little impact on the lake until the magnitude of the summer sediment release is reduced. An extended fall drawdown significantly increases the export of phosphorus from the lake and appears to be a feasible means of reducing the phosphorus pool at the top of the sediment. A hypolimnetic discharge appears to be more effective in discharging phosphorus than a fall drawdown, but requires the discharge of large volumes of anaerobic water.
W78-11368

VIRAL CONTROL OF NUISANCE BLUE-GREEN ALGAE,
California Univ., Riverside. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5G.
W78-11369

DETERMINATION OF THE SECONDARY PRODUCTION AND POPULATION DYNAMICS OF THE ZOOPLANKTON OF THE LAKE CHAMPLAIN ECOSYSTEM,
Vermont Univ., Burlington. Dept. of Zoology.
R. Keen, and M. Potash.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 094, Price codes: A05 in paper copy, A01 in microfiche. Completion Report, June 1978. 77 p, 14 fig, 23 tab, 18 ref, 7 append. OWRT A-028-Vt(1), 14-34-0001-7096.

Descriptors: Lakes, *Zooplankton, *Diurnal distributions, *Productivity, Vermont, Canada, Oligotraphy, Crustaceans, *Lake Champlain, Limnology, Plankton, *Daphnia, Mysis, Fluctuations, *Vertical migration, Aquatic population abundance, Distribution patterns.

The zooplankton of Lake Champlain were virtually unknown before this study. The main basin of the lake was sampled intensely July 1976-August 1977. Four other different water masses of the lake were sampled less intensely to provide a picture of the zooplankton of the whole lake. In general, the species present in the main lake were characteristic of deep, oligotrophic lakes. Populaton densities were maximal in the summer months at about 17,000 per cubic meter, and lower than this in the spring and fall. Diaptomid copepods generally dominated the crustacean plankton, while Daphnia spp. dominated the cladoceran component of the crustacea. Rotifers were 10-50 times more abundant numberically than the crustacea. Zooplankton populations in the lake's other basins for the most part followed the patterns of the main basin in species composition and abundance. One shallow basin was different, with much lower abundances, except for a strong spring occurrence of Daphnia. Series of samples to study daily vertical migration showed copepos and Mysis to be following the classic pattern. Daphnia did not show a strong migration. The two species of Bosmina were separated vertically in the water column.
W78-11376

COMPARISON OF RESIDUAL BIOTOXICITY OF CHLORINE AND BROMINE CHLORIDE TO COPEPODS,
Maryland Univ., Baltimore County, Baltimore. Dept. of Biological Sciences.
B. P. Bradley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 113, Price codes: A02 in paper copy, A01 in microfiche. Water Resources Research Center, University of Maryland, College Park, Technical Report No. 47, (1978). 15 p, 7 tab, 15 ref. OWRT A-040-Md(1), 14-34-0001-7044.

Descriptors: Zooplankton, Powerplants, *Biocides, Survival, *Reproduction, *Copepoda, Toxicity, *Chlorine, *Bromine chloride, Mortality, *Eurytemora, *Acartia, Water pollution effects.

The copepod species Eurytemora affinis and Acartia tonsa showed 50 to 60% mortality in cooling water with 0.5ppm C12 or BrC1 (applied dosage) when entrained in the cooling system. However, after 5 min contact time, the biotoxicity was reduced to insignificant levels, hence mortalities in the mixing zone, given the applied dosage would be negligible. There were no significant differences between residual biotoxicities of chlorinated and chlorobrominated cooling waters at either the low applied dose rates or at higher rates. The LC50 values were 362-26ppb and 403-46ppb at 24 hrs for bromine chloride and chlorine, respectively. Reproduction of Eurytemora was only affected at dosage rates well above those used in practice.
W78-11378

IMPACT OF URBAN RUNOFF ON WATER QUALITY IN THE OCCOQUAN WATERSHED,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
C. W. Randall, T. J. Grizzard, and R. C. Hoehn.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 046, Price codes: A05 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 80, May 1978. 77 p, 21 tab, 27 fig, 11 ref. OWRT C-5341(4239)(11).

Descriptors: *Storm runoff, *Urban runoff, Water pollution sources, Biochemical oxygen demand, Coliforms, Heavy metals, Nutrients, Suspended solids, Hydrographs, *Virginia, *Occoquan watershed(Va), *Total organic carbon.

The continued growth of the Washington, DC urban areas has prompted concern over the impact of unrecorded sources of pollution on the Occoquan Resevoir, which serves an estimated 600,000 customers. This research identified and characterized runoff pollution loads from the principal urban areas in the Occoquan Watershed, and assessed their probable impact on the downstream impoundment. It also studied the biochemical oxygen demand (BOD) exertion kinetics of urban runoff. The two principal sampling periods were June-mid-Sept. 1974 and April-July 1975. Total hydrograph hand-sampling techniques were used for data collection purposes at all stations in or near the urban area. Samples were analyzed for all nitrogen and phosphorus forms, suspended solids, total organic carbon (TOC), and pH; some were measured for BOD5, heavy metals, and coliform content, both total and fecal. Using hydrographs, total runoff loads were calculated for each storm and each pollutant measured. Results were compared on the basis of land use and point source contributions. Results show that suspended solids, orgaic matter, and heavy metals were the most significant parameters of urban runoff. Urban runoff is a significant source of pollution and should be included in all watershed-wide pollution abatement programs.
W78-11383

EUTROPHICATION MODELS FOR LAKES,
Vandkvalitetsinstitut, Hoersholm (Denmark).
J. F. Simonsen, and K. In. Dahl-Madsen.
Nordic Hydrology, Vol 9, No 2, p 131-142, 1978. 5 fig, 2 tab, 20 ref.

Descriptors: *Eutrophication, *Lakes, *Model studies, *Mathematical models, Nutrients, Detritus, Sediments, Nitrogen, Phosphorus, Algae, Foreign research, Water temperature, Biomass, Chlorophyll, Inflow, Discharge(Water), Retention, Limnology.

In the years 1970-1977, eutrophication models were developed and applied for about 15 shallow Danish Lakes. The structures of these models were discussed. An example of the calibration of the model on data from Lake Gyrstinge in the Susa catchment area was shown, and the use of the model for calculating ecological consequences of changed hydraulic retention times was demonstrated. The dynamic eutrophication model was compared to the Dillon-Rigler version of the input-output model. Limitations of both types of models were discussed. (Sims-ISWS)
W78-11429

POLYCHLORINATED BIPHENYL (PCB) DEGRADING BACTERIA AND PCB IN ESTUARINE AND MARINE ENVIRONMENTS,
Maryland Univ., College Park. Dept. of Microbiology.
G. S. Sayler, R. Thomas, and R. R. Colwell.
Estuarine and Coastal Marine Science, Vol 6, No 6, p 553-567, June 1978. 2 fig, 9 tab, 27 ref. NOAA 04-5-15811, NSF GD-31207.

Descriptors: *Polychlorinated biphenyls, *Bacteria, *Estuaries, *Oceans, *Chesapeake Bay, *Atlantic Ocean, Marine bacteria, Marine microorganisms, Water pollution, Pollutants, Path of pollutants, Surveys, Sampling, Chemical analysis, Sediments, Sea water, PCB-degrading bacteria.

Surface water and sediment samples collected throughout the Chesapeake Bay and along the southeast Atlantic Coast, extending from Miami, Florida, to Cape Hatteras, North Carolina, were analyzed for the presence of polychlorinated biphenyl (PCB)-degrading bacteria and PCB. PCB-degrading bacteria were recovered from all samples for which enumeration was attempted. In Addition, the occurrence of PCB was detected in all samples analyzed for PCB. Compared with marine samples, both PCB-degrading bacteria and PCB were found in higher concentrations in estuarine waters and sediment. The data obtained indicated a greater correlation between PCB concentrations and numbers of PCB degrading bacteria in areas of urbanization as opposed to areas distant from land. These results suggest that assessment of existing PCB-degrading bacteria provides a potential indicator of PCB contamination. Because PCB-degrading bacterial populations were correlated much more highly with nutritional factors governing microbial growth, the extent of microbial PCB degradation by natural microbial populations remains undetermined. (Sims-ISWS)
W78-11430

THE ROLES OF NUTRIENT CYCLING AND RADIANT ENERGY IN AQUATIC COMMUNITIES,
D. W. Schindler, and E. J. Fee.
In: Photosynthesis and Productivity in Different Environments, Cooper, J.P., Ed., Cambridge University Press, London, 1975, p 323-343. 6 fig, 61 ref.

Descriptors: *Cycling nutrients, *Light intensity, *Photosynthesis, *Phytoplankton, *Methodology, *Eutrophication, Nutrients, Plant growth, Primary productivity, Algae, Lakes, Canada, Experimental Lakes Area(Ontario-Canada), Phosphorus, Carbon, Sedimentation, Model studies, Water management, Analytical techniques, Solar radiation, Measurement, Limiting factors.

Traditional field methods of limnological observation, designed to monitor rather than predict changes in photoplankton growth and production related to nutrient and light regimes, have been unsatisfactory for investigating causal relationships; data collected by such methods contain intolerable amounts of environmentally-spuridus information. Controlled laboratory experiments likewise have proven unsatisfactory for unraveling underlying changes in function of the aquatic ecosystem, as algae may give one response in the laboratory and an entirely different one under natural conditions. This paper discusses and evaluates methods suitable for studying the dynamics of causal factors, based on extensive field work largely conducted in the Experimental Lakes Area of northwestern Ontario. Areas covered are: (1) measuring the relationship between phytoplankton production and light; (2) limiting nutrients and phytoplankton production; (3) combined effects of light and nutrients; (4) relationships between inorganic nutrients and phytoplankton production; (5) input and output of nutrients from lakes; (6) utilization of organic substrates by phytoplankton; (7) interpreting applied production problems in terms of nutrients and radiant energy; and (8) modelling relationships between phytoplankton, nutrients, and light. A concluding section assesses the implication for water management. Poor knowledge of the phytoplankton-nutrient-light system could result in useless, expensive, and potentially harmful management schemes. (Lynch-Wisconsin)
W78-11508

THE PHOSPHORUS STATUS OF EUTROPHIC LAKE SEDIMENTS AS RELATED TO CHANGES IN LIMNOLOGICAL CONDITIONS-PHOSPHORUS MINERAL COMPONENTS,
Battelle Pacific Northwest Labs., Richland, WA.
R. E. Wildung, R. L. Schmidt, and R. C. Routson.
Journal of Environmental Quality, Vol. 6, No. 1, p 100-104, 1977. 1 fig, 3 tab, 21 ref. EPA Water Quality Office 14-12-508.

Descriptors: *Phosphorus, *Eutrophication, *Sediments, *Phytoplankton, *Upper Klamath Lake(OR), *Inorganic compounds, Lakes, Limnology, Iron, Aluminum, Carbon, Mineralization, Nutrients, Nutrient flux, Algae, Oregon, Sediment-water interfaces, Serial extraction procedure.

Fractionation techniques were used to identify inorganic phosphorus components in sediments eutrophic Upper Klamath Lake, Oregon, responsible for changes observed in phytoplankton growth. Sediment phosphorus was earlier found to decrease with phytoplankton growth and increase with their decline. In this study, release of phosphorus from sediments during periods of maximal biological productivity in the shallow bay waters was due primarily to reductions in inorganic phosphorus mineral components soluble in sodium hydroxide (0.1 M) and citrate-dithionite; this suggests that phosphorus associated with hydrated iron oxides was the principle source of phosphorus to the overlying waters and to the biota. Increases in sediment inorganic phosphorus, which occurred when phytoplankton growth diminished, were due principally to increase in phosphorus mineral components soluble in NH4F, indicating that resorbed phosphorus was fluorine-exchangeable and/or associated with crystalline and amorphous aluminum-phosphorus components. Changes in the form of sediment phosphorus which occurred in the lake and in laboratory equilibrium studies indicated that conversion of resorbed NH4F soluble-phosphorus to sodium hydroxide (0.1 M) and citrate-dithionite soluble-phosphorus must be a relatively long-term (> two years) process. Taken together, the NH4F, the sodium hydroxide (0.1 M), and citrate-dithionite fractions accounted for about 85% of the seasonal variance in total inorganic phosphorus which occurred at all stations. (Lynch-Wisconsin)
W78-11509

PRODUCTION OF VOLATILE SULFUR COMPOUNDS DURING THE DECOMPOSITION OF ALGAL MATS,
Wisconsin Univ., Madison. Dept. of Bacteriology.
S. H. Zinder, W. N. Doemel, and T. D. Brock.
Applied and Environmental Microbiology, Vol. 34, No. 6, P 859-860, December 1977. 1 fig, 1 tab, 9 ref.

Descriptors: *Cyanophyta, *Algal mats, *Degradation(Decomposition), *Sulfur, Volatility, Algae, Anaerobic conditions, Hydrogen sulfide, Methyl mercaptan, Dimethyl sulfide, Light, Darkness, Shading, Yellowstone National Park, Octopus Spring(WY), Wyoming.

Cores of blue-green algal mat collected from a hot spring effluent (Octopus Spring) in Yellowstone National Park, placed under anaerobic conditions and incubated in the dark, rapidly produced large amounts of volatile sulfur compounds. These compounds included hydrogen sulfide, methyl mercaptan, and dimethyl sulfide. The major organic sulfur compound was methyl mercaptan, in contrast to previous experimental results with marine eucaryotic algae. When cores were incubated in the light instead of the dark, production of all volatile organic compounds was much lower, presumably due to conversion of the system to aerobic as a result of algal oxygen production. In the natural environment, because of intense self-shading in the compact mats, net photosynthesis occurs only in the top three mm of mat, and beneath this zone decomposition is the primary process occurring. As the mat grows upward the algae beneath go into darkness and decompose. In preliminary anaerobic experiments it was found that decomposition was most rapid in the top three mm, apparently because breakdown of easily decomposable proteinaceous materials had already occurred. In the current experiments the major product formed was hydrogen sulfide. Addition of five mg of methionine to a top layer of mat strongly inhibited

production of hydrogen sulfide, but a large amount of dimethyl disulfide was formed. Hydrogen sulfide, methyl mercaptan, and dimethyl sulfide probably arise directly during the decomposition of algal protein constituents. (Lynch-Wisconsin)
W78-11510

EFFECT OF NUTRIENT ENRICHMENT ON GROWTH OF THE EELGRASS ZOSTERA MARINA IN THE CHESAPEAKE BAY, VIRGINIA, USA,
Virginia Inst. of Marine Science, Gloucester Point.
R. J. Orth.
Marine Biology, Vol. 44, No. 2, p 187-194, 1977. 3 fig, 5 tab, 28 ref.

Descriptors: *Chesapeake Bay, *Nutrients, *Eelgrass, *Zostera marina, *Fertilizers, *Plant growth, Water pollution effects, Limiting factors, Sediments, Ruppia maritima, Virginia, Delmarva Peninsula, Turions, Biomass, Length, Shading, Ecosystems, Sea grasses, Bays, Intertidal areas, Depth.

Experimental addition of two commercial fertilizers to a bed of eelgrass (Zostera marina) in Chesapeake Bay off Church Neck, Delmarva Peninsula, Virginia, greatly increased the length, biomass, and total number of turions over controls at both shallow and deep stations during a two to three month period. Results suggest: (1) Z. marina beds in Chesapeake Bay are nutrient-limited, (2) growth form of Z. marina may be related to sediment nutrient supply, and (3) Z. marina may competitively exclude Ruppia maritima by light-shading. Fertilizers used were: (1) 5% ammonium nitrate, 10% phosphoric anhydride, 10% potassium oxide; and (2) 10% ammonium nitrate, 10% phosphoric anhydride, 10% potassium oxide. The area is characterized by an extensive intertidal sand flat populated by patchy widgeon grass (R. maritima) and grading into a mixed subtidal seagrass bed of Z. marina and R. maritima, and then into a monospecific bed of Z. marina in deeper portions. Two stations were established, Station A in 0.3 m of water, and Station B in 0.6 m of water (mean low water). No significant difference was found between the two fertilizers for any of the parameters monitored. There were significantly more turions in both fertilized plots and controls in the shallow area than in the deeper area, but turions in deep plots were significantly longer than those in shallow plots. (Lynch-Wisconsin)
W78-11512

EUTROPHICATION POTENTIAL OF DAIRY CATTLE WASTE RUNOFF,
Utah State Univ., Logan.
D. S. Filip, and E. J. Middlebrooks.
Water Research, V. 10, No. 1, p. 89-93, Dec., 1976. 6 fig., 13 ref.

Descriptors: Nutrients, *Eutrophication, Water pollution, Toxicity, Nitrogen, Phosphorus, *Farm wastes, *Agricultural runoff, *Cattle wastes, Dairy wastes, *Feedlot runoff, Algal growth.

Utilizing standard bottle test algal bioassays correlated with chemical analyses for growth limiting nutrients, the biostimulatory and chemical characteristics of dairy cattle waste runoff were evaluated. Comparisons were made between this very concentrated runoff collected could only be sampled after much dilution by spring and stream waters. The dairy feedlot runoff was extremely rich in nutrients, and in very dilute concentrations it stimulated prolonged algal growth, indicating a strong pollution potential. In more concentrated solutions biostimulation was inhibited by toxicity which seemed indigenous to concentrated runoff water. Toxicity was found in beef cattle runoff in earlier studies. Topography and animal numbers differed between the dairy feedlot and the beef cattle lots precluding exacting comparisons. However, the chemical nature of the more concentrated dairy cattle runoff was consistent; whereas, the water chemistry of the more dilute beef runoff changed suddenly in response to changes in cattle density near the streams. (East Central)
W78-11513

SOME ASPECTS OF THE ECOLOGY OF PARATYA AUSTRALIENSIS (CRUSTACEA: DECAPODA: ATYIDAE),
Adelaide Univ. (Australia). Dept. of Zoology.
W. D. Williams.
Australian Journal of Marine and Freshwater Research, Vol. 28, No. 4, p 403-415, August 1977. 5 fig, 5 tab, 24 ref.

Descriptors: *Crustaceans, *Paratya australiensis, *Australia, *Ecology, *Life history studies, *Prawns, Decapods, Hatching, Plankton, Larvae, Breeding, Running waters, Rivers, Lakes, Atyidae, Victoria(Australia), Classification, Habitats.

The life cycle and habitat of the crustacean decapod Paratya australiensis in running waters of southern Victoria, Australia, were investigated. Atyid prawns, the most common in southeastern Australia, are unusual in having a planktonic larval stage, and yet are ubiquitous in rivers and slowly flowing waters. While three Australian species of Paratya have been described, only P. australiensis can be accepted pending further revision of the genus. The species occurs in Australia in a broad southeastern arc in a variety of permanent inland waters, including coastal streams, rivers, lakes, farm dams, and ponds. New records clearly extend the known range into southeastern South Australia, southwestern New South Wales, and further north into Queensland. Vegetated areas are favored. Young prawns hatch as free-floating larvae and hatching occurs mainly in early summer in southern Australia, the breeding season appears adapted to the hydrological regime of running waters. Sampling for this study was concentrated on Cardinia Creek, sampled September 1961-January 1964, supplemented by data for November 1962 from Toomuc Creek, Bunyip Creek, Glenmaggie Reservoir, and Latrobe River; all are in southern Victoria. A series of monthly samples during the breeding season was obtained from Toomuc Creek, a ditch, and Lysterfield Reservoir. (Lynch-Wisconsin)
W78-11514

STUDIES ON THE ECOLOGY OF SOME TEMPORARY FRESHWATER POOLS IN VICTORIA WITH SPECIAL REFERENCE TO MICROCRUSTACEANS,
Monash Univ., Clayton (Australia). Dept. of Zoology.
D. W. Morton, and I. A. E. Bayly.
Australian Journal of Marine and Freshwater Research, Vol 28, No 4, p 439-454, August 1977. 6 fig, 6 tab, 40 ref.

Descriptors: *Crustaceans, *Victoria(Australia), *Temporary ponds, *Zooplankton, *Ecology, *Species composition, Copepods, Cladocerans, Conductivity, Dissolved oxygen, Hydrogen ion concentration, Turbidity, Arid lands, Faunal lists, Ostracods, Succession, Saycia cooki, Ponds, Australia.

Microcrustaceans and chemical parameters of 53 temporary pools mainly located in eastern Victoria, Australia, were studied February-September 1973. In the pools, with a mean depth of 23 cm, pH ranged from 5.7-8.2 (mean 6.9), conductivity (K18) from 55-5500 microS/cm (mean 340), dissolved oxygen 23-170% saturation (mean 72%), and turbidity 2-310 Formazin turbidity units (mean 50). A total of 60 microcrustacean species was recorded: 22 Cladocera, 20 Copepods, 13 Ostracoda, two Conchostraca, two Anostraca, and one Notostraca. Most localities were sampled for biota only once, but eight were selected for repeated sampling. Saycia cooki was the most frequently occurring cladoceran (in 22 of 38 pools sampled June-August); it was not recorded before May 24 with one exception. The fact that S. cooki reaches peak numbers early in the life of a pool probably relates to the production of large numbers of ephippial eggs. Cladocera producing only 1-2 ephippial eggs, such as Chydorus, Moina, and Simocephalus, tend to appear later in succession. Benthic Simocephalus expinosus and planktonic Daphnia carinata, with mutually exclusive distributions, appear unable to coexist in shallow waters. Endemic cyclopoid copepods encountered included three new species of Microcyclops, M. arnaudi, Acanthocyclops australis, and Acanthocyclops sp. nov. Computer analysis showed four species groups with a high probability of co-occurrence. These pools, although common in Australia, have attracted little previous research attention. (Lynch-Wisconsin)
W78-11515

ATTENUATION OF LIGHT IN NATURAL WATERS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
J. T. O. Kirk.
Australian Journal of Marine and Freshwater Research, Vol 28, No 1, p 497-508, 1977. 10 fig, 1 tab, 8 ref.

Descriptors: *Attenuation, *Light intensity, *Light penetration, *Photosynthesis, *Solar radiation, *Optical properties, *Water, Limnology, Absorption coefficient, Scattering coefficient, Volume scattering function, Algae, Phytoplankton, Chlorophyll, Plant growth, Coasts, Australia, Light, Irradiation, Primary productivity, Lakes, Oceans.

The paper discusses and defines: (1) properties of light incident upon water; (2) inherent optical properties of water, which determine the way in which water interacts with light; and (3) attentuation effects on light as it penetrates water. The general principles involved are illustrated with published data and from studies conducted by the author; examples cited are the Tasman Sea, Lake Burley Griffin (Canberra, Australia), Burrinjack Dam, Batemans Bay, and Lake George. Light, or photosynthetically active radiation (PAR), is defined as that waveband of solar radiation which can be used by plants for photosyntheais, and covers the waveband between 350 or 400 and 700 nm. Properties of incident light include: (1) intensity, (2) spectral distribution, and (3) angular distribution. Three inherent optical properties of water are defined: (1) absorption coefficient, (2) scattering coefficient, and (3) volume scattering function. When light penetrates water, there is a diminution in intensity and change in spectral quality (attenuation) with increasing depth and according to the different types of water. The characteristic pattern of attenuation of total PAR in inland and coastal waters is discussed. The most suitable instrument for studying underwater light is a submersible quanta meter. (Lynch-Wisconsin)
W78-11516

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN, VI. ECOLOGY OF THE EUPHAUSIACEA,
Sydney Univ. (Australia). Dept. of Zoology.
P. S. McWilliam.
Australian Journal of Marine and Freshwater Research, Vol 28, No 5, p 627-644, 1977. 3 fig, 8 tab, 46 ref.

Descriptors: *Euphausiacea, *Indian Ocean, *Zooplankton, *Ecology, *Distribution patterns, Oceans, MULTICLAS, Seasonal, Latitudinal studies, Ephausia mutica, Ephausia tenera, Ephausia brevis, Stylocheiron carinatum, Stylocheiron suhmii, Stylocheiron affine.

Examination of 26,427 euphausiids from 82 night and 93 day station samples taken by vertical hauls in the upper 200-m stratum along the 110 degree E. meridian in the eastern Indian Ocean during 1962-63 indicated day samples contained mainly larvae and juveniles, and night samples contained more adults. Six small euphausiid species were the most abundant and ubiquitous: Euphausia mutica, E. tenera, E. brevis, Stylocheiron carinatum, S. suhmii, and S. affine. Their distribution overlapped according to distribution of the tropical and subtropical water masses and their mixtures in the upper 150 m. These species were commonly observed in breeding condition; their larval distribution was related to distribution of the breeding adults. Rare and less ubiquitous species (mainly younger stages and deeper living species) showed more pronounced relationships with seasonal water movements. Food appeared more important than temperature or salinity in influencing distribution, abundance, and species associations. Although the sampler used (Indian Ocean Standard net, mesh size 0.33 mm), probably did not adequately sample all size ranges, and sampling depth probably excluded levels of concentration of adults and juveniles of many species, the data permitted characterization of night distribution of euphausiid species in the upper 200 m, an investigation of their relationships with the environment, and comparisons of results with previous descriptions. (Lynch-Wisconsin)
W78-11517

UTILIZATION OF BLUE-GREEN ALGAE BY LARVAE OF SHORE FLIES,
Kent State Univ., OH. Dept. of Biological Sciences.
B. A. Foote.
Environmental Entomology, Vol 6, No 6, p 812-814, December 1977. 1 tab, 15 ref. NSF DEB 75-21352.

Descriptors: *Shore flies, *Ephydridae, *Cyanophyta, *Larvae, *Insects, Algae, Invertebrates, Feeding, Foods, Eutrophication, Setacera atrovirens, Setacera pacifica, Scatella stagnalis, Hyadina, Lytogaster, Pelina truncatula, Axysta cesta, Cylindrospermum, Nostoc, Anabaena, Lyngbya.

Larvae of 12 species of shore flies (Ephydridae) have been found capable of ingesting and assimilating blue-green algae, a discovery which may have practical significance to the study of eutrophication. Setacera atrovirens was reared from Nostoc, and S. pacifica from Anabaena. Scatella stagnalis was obtained from Nostoc colonies. Larvae of three species of Hyadina (H. binotata, H. neglecta, and H. subnitida), four species of Lytogaster (L. abdominalis, L. excavata, L. flavipes, and L. furva), and Pelina truncatula were reared from colonies of soil-inhabiting species of Cylindrospermum. Larvae of Axysta cesta were found in a colony of Lyngbya growing on moist tree leaves near a shaded pond. Species of Hyadina, Lytogaster, and Axysta appear to be trophic specialists, as they have been reared only from colonies of cyanophytes. By contrast, the two Setacera species and S. stagnalis are polyphagous, ingesting a wide mix of cells belonging to several algal classes. Field observations, laboratory rearings, and gut analyses were used along with published material in this report. It is probable that some cyanophytes possess nutritional, chemical, or morphological traits that protect them from most grazing herbivores. The few invertebrates that can ingest, degest, and assimilate blue-green algae apparently have either overcome the algal defense mechanisms, or possibly a few groups of cyanophytes (such as Cylindrospermum or Lyngbya) lack defenses--at least against certain grazers. (Lynch-Wisconsin)
W78-11518

PHYTOPLANKTON STUDIES IN THE WATER COLUMN AND IN THE PACK ICE OF THE WEDDELL SEA,
Texas A and M Univ., College Station. Dept. of Oceanography.
S. Z. El-Sayed, and S. Taguchi.
Antarctic Journal of the U.S., Vol 12, No 4, p 35-37, October 1977. 2 fig, 1 tab, 2 ref.

Descriptors: *Weddell Sea, *Phytoplankton, *Antarctic Ocean, *Primary productivity, *Ice algae, *Ice cover, *Cold regions, Krill, Oceans, Chlorophyll, Salinity, Eutrophication, Pack ice, Algae, Zooplankton, Adenosine triphosphate, Metabolites, Copepods, Euphausiids, Light penetration, Fluorescence, Nannoplankton, Pigments.

Various studies of phytoplankton, fluorescence, primary productivity, and other oceanographic biological parameters made during a cruise in the Weddell Sea near Antarctica February 10-March 15, 1977 are reviewed. Special emphasis was placed on the ecology and metabolism of ice algae in the pack ice, and on assessment of their contribution to organic production of antarctic waters. Preliminary results of salinity experiments showed ice algae growth was highest in 100% seawater. The ice mantle is important in the study of the krill (planktonic crustaceans and larvae), because distribution of krill generally corresponds to the area seasonally covered by pack ice. In vivo fluorescence was determined on ice core samples taken at six stations. Maximum fluorescence was usually much higher in the ice cores than in surface water except at stations south of latitude 75. Maximum fluorescence at a sample station was observed at a depth of 60-70 cm (189 units), which corresponded to the maximum salinity in the ice core. The contributions of nannoplankton to primary production were studied, and feeding experiments were conducted with euphausiids and copepods. Estimates were made of the standing crop of phytoplankton and concentrations of extracellular metabolites, adenosine triphosphate, chlorophyll-a, -b, and -c, carotenoids, phaeopigments, particulate organic carbon, particulate organic nitrogen, and dissolved organic carbon. The relation of light penetration to several parameters was studied. (Lynch-Wisconsin)
W78-11519

MACROPHYTIC VEGETATION OF THE RIVER SWALE, YORKSHIRE,
Durham Univ. (England). Dept. of Botany.
N. T. H. Holmes, and B. A. Whitton.
Freshwater Biology, Vol. 7, No. 6, p 545-558, 1977. 4 fig, 6 tab, 27 ref.

Descriptors: *Swale River(England), *Macrophytes, *Aquatic plants, *Water transfer, *Distribution, England, Rivers, Tees River(England), Bryophytes, Angiosperms, Baseline studies, Floral lists, Riparian plants, Banks, Submerged plants, Habitats, Environmental effects.

The River Swale (Yorkshire, England) is likely to receive water from the River Tees as part of a future water transfer scheme, and a description is given here of the macrophytic vegetation of the River Swale in 1976 as a baseline for later comparison. The survey, made in July 1976 by recording the presence or absence of macrophytes within selected 0.5-km sections of the river, with subjective estimates of relative abundance, resulted in identification of 132 species of photosynthetic plants. A total of 14 sites, with four consecutive 0.5-km lengths at each site, were investigated. The river can be divided into three zones on the basis of physical features and vegetation: (1) Upper zone--rocky substrata, fast flows, and a macrophytic vegetation composed largely of bryophytes. (2) Middle zone--unconsolidated substrata, and a relatively sparse macrophytic vegetation. (3) Lower zone--silted, with a macrophytic vegetation consisting mostly of angiosperms. Of the 132 macrophytes, 33 were restricted to river habitats (submerged at least 85% of the year), 50 to bank habitats (submerged 40-85% of the year), and 49 occurred in both habitats. Comparison of the flora of the Swale and the Tees shows that 11 species of river angiosperms present in the Tees above the projected abstraction point are absent from the Swale above the Future inflow point. No species of the Tees are likely to spread rapidly in the Swale upstream from the inflow point, unless the Swale were to become regulated by an upstream reservoir. (Lynch-Wisconsin)
W78-11520

THE TEMPORAL AND SPATIAL DISTRIBUTION OF THE VALVES OF THE DIATOM RHOICOSPHENIA CURVATA IN THE RIVER WEY,
Surrey Univ., Guilford (England). Dept. of Microbiology.
M. O. Moss.
Freshwater Biology, Vol. 7, No. 6, p 573-577, 1977. 3 fig, 6 ref.

Descriptors: *Wey River(England), *Farnham Wey(England), *Rhoicosphenia curvata, *Diatoms, *Indicators, *Mixing, Valves, Phytoplankton, Rivers, Tributaries, England, Algae, Seasonal, Distribution, Spatial distribution.

Valves of the diatom Rhoicosphenia curvata found in the River Wey (Surrey, England) primarily at its confluence with its tributary, Farnham Wey, are a convenient bioindicator for the boundary of the mixing zone of the two bodies of water. Farnham Wey was found to be the source of R. curvata valves, which were not found in significant numbers either upstream or downstream of the confluence. The valves were most numerous in suspension in the river in summer, although the living organism is an epiphyte growing and dividing vigorously during early spring and even late winter. It is suggested that dead cells and detached valves are released into the river from its tributary during the summer, there being no evidence that R. curvata can actively divide or survive as a member of the river plankton. The unique shape of the valves makes it particularly easy to recognize in both valve and girdle views. For this study samples were collected with one-liter bottles during 1972-74 fortnightly at five stations for seasonal changes and annually (in May) at 26 stations for spatial distribution. Qualitative observations made on a small stream overflowing from a lake at the University of Surrey, in which R. curvata is a regular component of the epiphytic diatom flora, show that the diatom reproduces most vigorously on Cladophora early in the year. The decrease in numbers of valves downstream from Farnham Wey is due to sedimentation and dilution. (Lynch-Wisconsin)
W78-11521

POPULATION STRUCTURE, LIFE HISTORIES AND ABUNDANCE OF COPEPODS IN TJEUKEMEER, THE NETHERLANDS,
Limnological Inst., Oosterzee (Netherlands). Tjeukemeer Field Station.
J. Vijverberg.
Freshwater Biology, Vol. 7, No. 6, p 579-597, 1977. 9 fig, 4 tab, 53 ref.

Descriptors: *Tjeukemeer(Netherlands), *Copepods, *Life history studies, *Population, *Diapause, Netherlands, Zooplankton, Acanthocyclops robustus, Mesocyclops leuckarti, Cyclops vicinus, Eurytemore affinis, Fecundity, Reservoirs, Polders, Size, Mortality, Species composition, Seasonal, Resting stages, Water temperature, Classification.

Sampling in 1969-71 of the copepod zooplankton of Tjeukemeer, a polder reservoir in the north of the Netherlands, resulted in identification of 10 species, and revealed that all cyclopoid species go into diapause. Seasonal variation in population

structure, fecundity, and sex ratio are described. Five species made up more than 99% of all individuals collected: Acanthocyclops robustus, 66%; Mesocyclops leuckarti, 13%; Cyclops vicinus, 11%; Eurytemora affinis, 9%; and Diacyclops bicuspidatus, 1%. The ecology of the A. robustus population differs from that in other areas in that it dominates the open water zone. Seasonal periodicity in abundance of each species was consistent during the three years of the study. The cyclopoid species A. robustus and M. Leuckarti go into diapause during the winter, while D. bicuspidatus and C. vicinus vicinus go into diapause during summer. Most species undergo diapause in a particular copepodite stage. Both population structure and sex ratio are influenced by diapause and size dependent mortality. Fecundity is more influenced by water temperature and age structure of the female population than by food conditions or size of females. Copepods represent 15-20% of mean annual zooplankton biomass. They are dominant over cladocerans in winter and early spring and often during autumn, but reach highest densities in late spring and summer. (Lynch-Wisconsin)
W78-11522

WINTER APPLIED MANURE: EFFECTS OF ANNUAL RUNOFF, EROSION, AND NUTRIENT MOVEMENT,
Agricultural Research Service, Morris, MN.
For primary bibliographic entry see Field 5G.
W78-11524

MERCURY AND CHLORINATED HYDROCARBONS IN PLANKTON OF LAKE PAIJANNE, FINLAND,
Jyvaskyla Univ. (Finland). Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-11526

EFFICACY OF COPPER SULPHATE IN THE SUPRESSION OF APHANIZOMENON FLOS-AQUE BLOOMS IN PRAIRIE LAKES,
Fisheries and Marine, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5G.
W78-11527

RESPONSE TO POLYCHLORINATED BIPHENYLS OF MARINE PHYTOPLANKTON ISOLATES CULTURED UNDER NATURAL CONDITIONS,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
C. D. Powers, R. G. Rowland, H. B. O'Connors, Jr., and C. F. Wurster.
Applied and Environmental Microbiology Vol. 34, No. 6, p 760-764, December 1977. 3 fig, 2 tab, 25 ref.

Descriptors: *Polychlorinated biphenyls, *Phytoplankton, *Thalassiosira, *Plant growth, *Photosynthesis, *Water pollution effects, *Estuarine environment, Long Island Sound, Flax Pond(NY), New York, Dialysis, Tidal marshes, Carbon cycle, Nutrient flux, Aroclors, Chlorophyll, Algae, Size, Biomass, Dinoflagellates.

A concentration of 10 micrograms/liter of polychloriated biphenyls (PCBs) substantially but temporarily suppressed growth rate and photosynthesis of two species of the marine dinoflagellate Thalassiosira, isolated from Long Island Sound and grown in dialysis membrane bags suspended in the tidal channel of Flax Pond, an estuarine marsh. Inhibition of carbon fixation appeared due to reduced levels of chlorophyll-a in the PCB-treated cells, but no significant loss of function per unit of existing chlorophyll-a was observed. Cell concentrations in all size classes from 12-18.6 microgram-equivalent spherical diameters were markedly lower in PCB-treated cultures, with total biomass equalling only 30% of control-cultures. Aroclor 1254 was the PCB used in the experiments. The growth rate of PCB-treated cells (based on optical counts) was lower than that of controls for four days in one experiment and for at least two days in the other. In the second experiment total particle concentration increased by a factor of 3.3 in control cultures during the first 24 hrs while remaining unchanged in PCB-treated cultures. Although after two days the rate of increase in particle concentration of treated cultures overtook the control rate, at four days total particle concentration of treated cultures was 46.5 ppm, compared with 143.8 ppm in controls. This study represents the first analysis of the response of recently isolated phytoplankters to PCBs under conditions of natural light, temperature, and nutrient flux. (Lynch-Wisconsin)
W78-11528

SURVEY OF THE SELENIUM CONTENT IN THE AQUATIC BIOTA OF WESTERN LAKE ERIE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
W. J. Adams, and H. E. Johnson.
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 10-14, October 1977. 2 fig, 4 tab, 19 ref.

Descriptors: *Water pollution effects, *Lake Erie, *Selenium, *Zooplankton, *Fish, *Sediments, *Pollutants, *Bioaccumulation, *Food chain, Water pollution sources, Great Lakes, Lakes, Industrial wastes, Powerplants, Waste disposal, Trophic level, Size, Fallout.

A comparison of water samples from various trophic levels in the western basin of Lake Erie showed significant progressive increases in mean selenium concentrations from water to sediment, and from water to zooplankton to fish. The difference in concentrations between fish and zooplankton may, however, simply reflect relative rates of accumulation of the organisms rather than biological magnification, Average selenium content in water samples was 0.003 + or - 0.001 ppm for filtered samples and 0.023 + or - 0.004 ppm for unfiltered; higher values for the latter are attributed to suspended solids and plankton. In sediment, the mean concentration was 0.36 + or - 0.07 ppm dry wt, and in zooplankton 2.54 + or - 0.15 ppm dry wt. Ten fish species were analyzed: yellow perch (Perca flavoscens), common shiner (Notropis comutus), spottail shiner (N. hudsonius), sheepshead (Alplodinotus grunniens), carp (Cyprinus carpio), white bass (Roccus chrysops), goldfish (Carassius auratus), gizzard shad (Dorosoma cepedianum), walleye (Stizostedion vitreum), and white sucker (Catastomus commersoni). Mean dry wt concentration for all fish combined was 3.59 + or - 0.17, with a range of 1.80 (common shiner) to 8.12 (sheepshead). Average content of yellow perch was 3.32. Concentration in yellow perch was directly related to size, but no such relationship was found for other species or between sexes. Selenium values in this study were somewhat higher than for other Great Lakes areas, possibly due to heavy industrialization and the presence of many fossil fuel power plants. (Lynch-Wisconsin)
W78-11529

PHYTOPLANKTON OF AN INSHORE AREA OF GEORGIAN BAY, LAKE HURON, PRIOR TO REDUCTIONS IN PHOSPHORUS LOADING,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
K. G. Nicholls, E. C. Carney, and G. W. Robinson.
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 79-92, October 1977. 10 fig, 43 ref, 1 append.

Descriptors: *Georgian Bay(Ontario Canada), *Penetang Bay(Ontario Canada), *Phytoplankton, *Phosphorus, *Nutrient removal, Ontario(Canada), Canada, Species composition, Nearshore zones, Sturgeon Bay(Ontario Canada), Floral lists, Chrysophyceae, Diatoms, Eutrophication, Lake Huron, Great Lakes, Bays, Baseline studies, Sewage treatment, Algae, Cryptomonas erosa, Biomass.

Phytoplankton were collected in Georgian Bay (Lake Huron) during ice-free periods (May-October) of 1973-74 prior to implementation of a 1974-75 phosphorus removal program at local municipal sewage works, which discharge into Penetang Bay and adjacent inshore areas. A 50% reduction in total phytoplankton biomass is predicted for Penetang Bay following reduced total phosphorus loading and certain Chrysophyceae may become more important. Diatoms (Bacillariophyceae) dominated throughout the study area, mainly Stephanodiscus astraea, S. invisititatus, Fragilaria crotonensis, F. capucina, Asterionella formosa, Tabellaria fenestrata, and Rhizosolenia longiseta. The cryptomonad Cryptomonas erosa was very abundant in Penetang Bay and constituted 20-60% of total biomass during most of the study period. Ice-free period mean biomass of total phytoplankton ranged from 1.6 cu mm/l in Sturgeon Bay to 6.3 cu mm/l in Penetang Bay. Predictions were based on relationships between average total phosphorus concentration, total phytoplankton density, and species composition in other Great Lakes waters and inland lakes of Ontario, Canada. Phytoplankton, chlorophyll, ad nutrient samples from Georgian Bay were collected biweekly as composite samples through the euphotic zone (twice the Secchi disk visibility). Some 150 algal taxa are listed in an appendix. (Lynch-Wisconsin)
W78-11530

DECLINES IN THE NEAR-SHORE PHYTOPLANKTON OF LAKE ERIE'S WESTERN BASIN SINCE 1971,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
K. H. Nicholls, D. W. Standen, G. J. Hopkins, and E. C. Carney.
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 72-78, October 1977. 6 fig, 12 ref.

Descriptors: Phytoplankton, *Lake Erie, *Phosphorus, *Nutrient removal, *Diatoms, *Eutrophication, Algae, Great Lakes, Lakes, Nearshore zones, Canada, Ontario(Canada), Kingsville(Ontario Canada), Biomass, Water pollution control, Waste water treatment, Detergent, Phosphates, Legislation, Regulation.

A series of reductions in phosphorus inputs to Lake Erie have decreased phytoplankton density 42% in the lake's western basin, from an average biomass of 5010 Areas Standard Units (A.S.U.)/ml in 1967-70 to 2900 A.S.U./ml in 1975. Although all classes of algae have decreased, diatoms account for most of the decline in total phytoplankton since they constituted 65-80% of the total during the study period. For the study, samples of Lake Erie water were taken at approximately weekly intervals during 1967-75 from the Union water treatment plant intake at Kingsville, Ontario, Canada and analyzed for phytoplankton species composition and density. The intake, which extends 450 m offshore, draws water at a depth of 3 m. One A.S.U. is equivalent to the area of algal material subtended by 400 sq micrometers. total phosphorus loading to the western basin has been greatly reduced in recent years, particularly during 1970-71 when the average daily input from the Detroit River declined from 71.2 to 41.6 metric tons. In 1970 the Canada Water Act reduced laundry detergent phosphate content to 20%, which decreased detergent phosphate discharges to Canadian Great Lakes waters by 25-30%. In 1973 detergent phosphate content was further reduced to 5%. Michigan limited detergent phosphate content to 8.7% in 1971. Prior to such legislation, detergent phosphates contributed about 40% of total phosphorus loading to Lake Erie. (Lynch-Wisconsin)
W78-11531

STUDIES OF THE LAKE WINGRA WATERSHED: AN INTERIM REPORT,
Wisconsin Univ.-Madison. Inst. for Environmental Studies.
O. L. Loucks, R. T. Prentki, V. J. Watson, B. J. Reynolds, and P. R. Weller.
Environmental Newsletter, Vol.7 No. 8, November 18, 1977. 45 p, 9 fig, 8 tab, 37 ref, 1 append.

Descriptors: *Lake Wingra(WI), *Watersheds(Basins), *Model studies, *Ecosystems, *Eutrophication, *Aquatic weed control, Wisconsin, Madison(WI), Simulation analysis, Lakes, Land use, Urban runoff, Nutrients, Nutrient flux, Littoral, Harvesting, Water pollution control, Systems analysis, Cycling nutrients, Water pollution sources, Algae, Phytoplankton, Limiting factors, Phosphorus.

An integrated series of interdisciplinary studies was begun in 1969 at eutrophic Lake Wingra, Madison, Wisconsin, to investigate several aspects of lake processes and management problems. Initial goals were to: (1) develop hydrologic, biologic, and nutrient cycle models for a man-modified drainage basin and quantify parameters; (2) conduct simulation studies for predicting human impact on land-water interactions; and (3) determine scientific bases for water quality improvement strategies in an urban watershed. By 1974 process models for phytoplankton, macrophyte, and fish growth were developed, and three related studies were initiated: (1) littoral zone model development, (2) role of consumers in aquatic phosphorus cycling, and (3) land-water interactions. In 1975 another study, 'littoral zone primary production, decomposition, and role in land-water interactions,' was begun; overall study emphasis shifted to synthesis of the separate process models and analysis through simulation of the total lake ecosystem. Results from such studies as 'analysis of nutrient dynamics in eutrophic and oligotrophic lake ecosystems' have established the validity of the systems approach. A major six-year study has been proposed to investigate 'efficacy and impact of intensive plant harvesting and nutrient detention in lake management.' The current report summarizes the progress of studies underway and describes the proposed harvesting study. (Lynch-Wisconsin)
W78-11532

THE LITTORAL AND PROFUNDAL BENTHIC NEMATODES OF LAKES WITH DIFFERENT TROPHY,
Warsaw Univ. (Poland). Zoological Inst. and Warsaw Univ. (Poland). Dept. of Hydrobiology.
K. Prejs.
Ekologia Polska, Vol. 25, No. 1, p 21-30, 1977. 1 fig, 4 tab, 23 ref.

Descriptors: *Zarnowieckie Lake(Poland), *Mikolajskie Lake(Poland), *Char Lake(Canada), *Trophic level, *Species diversity, *Nematodes, *Lakes, *Depth, *Dissolved oxygen, Abundance, Species composition, Poland, Canada, Littoral, Profundal zone, Benthic fauna, Eutrophication, Oligotrophy, Mesotrophy, Faunal list, Summer, Bioindicators.

Investigation of species composition, diversity, and abundance of nematodes in three lakes of different trophic levels showed the highest number of species (52) in the littoral of eutrophic Lake Mikolajskie (Poland), and the greatest number of individuals (about 700,000/sq m) in the profundal zone of oligotrophic, arctic, Char Lake (Cornwallis Island, Canada). The third lake studies was b-mesotrophic Lake Zarnowieckie, Poland. Samples were collected during the summers of 1972-74. The high species diversity in Lake Mikolajskie's littoral was particularly notable in parts overgrown by vegetation; in the profundal zone 12 species were found. In the littoral of Lake Zarnowieckie there were 16 species and in that of Char Lake 17 species. In contrast to the two Polish lakes, the most numerous and qualitatively-differentiated grouping of nematodes in Char Lake occurred in the profundal zone (19-26 m in depth). In Lakes Mikolajskie and Zarnowieckie the number of individuals and species gradually decreased with increasing depth. In Lake Mikolajskie the highest number of nematodes was 538,000/sq m in the littoral at a depth of 0.5 m. Usually lower numbers of nematodes and species in the profundal of eutrophic lakes compared with the littoral is due to reduced oxygen at greater depths. In Mikolajskie Lake oxygen content in near-bottom waters o the profundal zone varied from 9 mg 01/liter at 8 m to 0.3 at 22 m. In Char Lake oxygen below 24 m was 13-14 mg 01/l during summer near the bottom. (Lynch-Wisconsin)
W78-11533

POLLUTANTS FROM LAND-BASED SOURCES IN THE MEDITERRANEAN,
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 5B.
W78-11534

INFLUENCE OF EXTRACELLULAR POLYSACCHARIDES ON THE TOXICITY OF COPPER AND CADMIUM TO KLEBSIELLA AEROGENES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
G. Bitton, and V. Freihofer.
Microbial Ecology, vol. 4, p119-125, 1978. 4 fig., 1 tab., 30 ref.

Descriptors: *Chelation, *Cadmium, *Copper, Cytological studies, Toxicity, Mortality, Biological membranes, Heavy metals, Metals, *Bacteria, Water pollution effects, Path of pollutants, Biochemistry, Polymers, Organic compounds, *Klebsiella.

Capsular and non-capsular Klebsiella aerogenes were exposed to several levels of copper and cadmium in a series of experiments. It was found that the capsular strains were more resistant to the toxic effects of the metals. The authors concluded that the increased survival of encapsulated organisms was due to chelation of the metals by polysaccharides present in the capsule. (EIS-Deal).
W78-11536

NUTRIENTS AND PRODUCTIVITY AS INDICATORS OF THERMAL EFFLUENT UPWELLING INTERACTIONS IN LAKE MICHIGAN,
Argonne National Lab., IL.
For primary bibliographic entry see Field 5B.
W78-11537

LONG-TERM VARIATION OF ORGANOCHLORINE RESIDUES AND ASSEMBLAGES OF EPIBENTHIC ORGANISMS IN A SHALLOW NORTH FLORIDA (USA) ESTUARY,
Florida State Univ., Tallahassee. Dept. of Biological Science.
R. J. Livingston, N. P. Thompson, and D. A. Meeter.
Marine Biology, Vol 46, p 355-372, 1978. 9 fig, 7 tab, 60 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *DDT, *Polychlorinated biphenyls, *Estuaries, *Environmental effects, *Water quality, *Path of pollutants, *Biological communities, DDD, DDE, Pesticide residues, Estuarine environment, Turbidity, Salinity, Stress, Nutrients, Nitrogen compounds, Chlorophyll, Succession, Sediments, Fish, Spatial distribution, Dominant organisms, *Apalachicola Bay(Florida), *Mirex, Anchoa.

A 4-year study determined long-term trends of organochlorine residues (DDT, DDE, DDD, PCB's, mirex) and trawl-susceptible organisms in a shallow, river dominated estuary in North Florida (Apalachicola Bay, USA). Moderate levels of such compounds were found in various species prior to the restricted use of DDT in 1972. A subsequent precipitous decline in organochlorine residues was attributable to decreased upland usage, major flushing of the river basin in early 1973, and various factors associated with estuarine function. No mirex was found in sediments or aquatic organisms. Apparently the half-life of organochlorines is relatively short in this bay system. During the study period, seasonal river flow fluctuations dominated water color, turbidity, salinity, nutrients (NO3), chlorophyll a, and the temporal succession of fishes in the bay. Relative dominance of key fish species declined and stabilized while bay-wide species richness and diversity increased with time. Population and community trends appeared consistent with other studies showing similar patterns of dominance of stress-resistant fish populations and related changes in community parameters. In this case, the relatively predictable annual succession of fish associations allowed an appraisal of key forcing functions. Although the long-term trend of relative species representation is useful as an index of stress, new techniques are needed to analyze extensive field data so that functions such as trophic interactions are included in the estimation of causal relationships. There are indications that such effects could be related to the impact of organochlorine compounds on estuarine systems. (EIS-Deal)
W78-11538

THE EFFECTS OF SIMAZINE ON THE MOLLUSCAN FAUNA OF MORIANE LAKE, NEW YORK,
State Univ. of New York Coll. at Oneonta. Dept. of Biology.
W. N. Harman.
The Nautilus, Vol 92, No 3, p 129-134, 1978. 7 fig, 1 tab, 3 ref.

Descriptors: *Mollusks, *Algacides, *Pesticide toxicity, Cyanophyta, Benthic fauna, Copper sulfate, Diquat, Toxicity, Pesticide residues, Biological communities, Epilimnion, Mortality, Lakes, Algae, Gastropods, *Simazine, Moriane Lake, New York.

The CIBA-Geigy Chemical Company treated Moriane Lake with Simazine to control undesirable blue-green algal populations in 1974 and 1975. The author was to determine the effects of these treatments on the benthic fauna. The lake was not completely satisfactory for the analysis because typical benthic communities were not present, possibly because of previous applications of copper sulphate, and Diquat. Simazine applications theoretically equalling concentrations of 0.25 and 0.5 ppm after dispersal throughout the epilimnion did not have an important effect on profundal arthropod biomass. However, applications of 0.5 ppm (after dispersal throughout the epilimnion) did have debilitating effects on littoral mollusks. Populations of Goniobasis livescens that normally reproduce throughout the summer, recovered by the spring following treatment. Simazine applications of 0.5 ppm had severely debilitating effects on sublittoral populations of Vivaparus georgianus killing most immature individuals. It is hypothesized that synergistic reactions with dying algal cells were responsible for in situ mortality of these prosobranch gastropods. (EIS-Deal)
W78-11539

PREVENTION AND TREATMENT OF NITRITE TOXICITY IN JUVENILE STEELHEAD TROUT (SALMO GAIRDNERI),
National Fisheries Research Center, Seattle, WA.
G. A. Wedemeyer, and W. T. Yasutake.
Journal of Fisheries Research Board of Canada, Vol. 35, p 822-827, 1978. 3 fig, 6 tab, 14 ref.

Descriptors: *Toxicity, *Nitrites, *Fish physiology, Hydrogen ion concentration, Bioassay, Salmonids, Rainbow trout, Nitrogen compounds, Juvenile growth stage, Growth rates, Water chemistry, Fish diseases, Alkaline water, Hardness(Water), *Methylene Blue.

The efficacy of mineral salts, pH, and tetramethylthianine (methylene blue) treatment in reducing the acute toxicity of nitrite to fingerling steelhead trout was determined using a static bioassay system at 10C. The acute toxicity was reduced by a factor of about 24 for 5-g steelhead and 13 for 10-g fish when the total water hardness was increased from 25 to 300 mg/L (as Ca CO3). NaCl or Ca Cl2 additions (0-200 mg/L) reduced toxicity by a factor of up to 3 for NaCl and 50 for Ca Cl2. Increasing the pH from 6.0 to 8.0 decreased toxicity by a factor of about 8 for the smaller and 3 for the larger fish. Methylene blue at 0.1 or 1.0 mg/L was effective in decreasing acute toxicity. For alleviating methemoglobinemia, removing the fish to freshwater for 48 h was about as effective as 1.0 mg/L methylene blue. Chronic exposure in soft water to 0.3 mg/L NO2-N for 6 mo caused no significant growth reduction, gill histological changes, hematological dyscrasias, or impaired ability of the smolts to adapt to 30o/oo seawater and grow for an additional 2 mo. (EIS-Katz)
W78-11541

EFFECTS OF DL-THYROXINE ON SWIMMING SPEED IN PEARL DANIO BRACHYDANIO ALBOLINEATUS (BLYTH),
Fordham Univ. at Lincoln Center, New York. Div. of Science and Mathematics.
A. H. Katz, and H. M. Katz.
Journal of Fish Biology, Vol. 12, p 527-530, 1978. 1 fig, 3 tab, 6 ref.

Descriptors: *Fish physiology, *Fish behavior, Animal metabolism, Biochemistry, Fish migration, Animal behavior, Food habits, Laboratory tests, Biorhythms, Bioassay, Methodology, *Pearl Danio, *Brachydanio, *Hormone, *Thyroxine.

Pearl Danios were allowed four days for acclimation in river-water filled aquaria maintained at a mean temperature of 27C. A different concentration of DL-thyroxine (T4) was added to each of two aquaria. A third aquarium served as a control and received no hormone. Photoperiod, feeding, aeration, and observer interference were controlled so as not to influence the results of the study. Mean swimming speeds for the fish in each aquarium were calculated. Compared with the control, significant increases in swimming speed were found with concentrations of thyroxine in water of 1:4 x 10 to the 6th power and 1:1 x 10 to the 6th power. The difference in swimming speed between the two hormone-treated groups was not significant. The fact that exogenous thyroxine will increase swimming speed may indicate that endogenous thyroid hormone plays a significant role in such fish behavior as migration. (EIS-Deal)
W78-11542

THE EFFECTS OF INTERMITTENT CHLORINATION ON TEN SPECIES OF WARM-WATER FISH,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
A. S. Brooks, and G. L. Seegert.
Special Report No. 35, 1978, 46 p, 11 tab, 12 fig, 35 ref.

Descriptors: Freshwater fish, *Toxicity, Mortality, Bioassay, Methodology, *Chlorine, *Water temperature, Channel catfish, Sunfish, Minnows, Laboratory tests, Carp, Bass, Laboratory equipment, *Lake Michigan, Warmwater fish, *Monochloramine, *Resistant species, *Sensitive species, LC50 values, Safe levels.

Ten warmwater fish species were tested at 10, 20, and 30C to determine their resistance to monochloramine. All species exhibited an inverse relationship between temperature and LC50 values. LC50 values generally decreased by a factor of two as the exposure temperature increased from 10 to 30C. LC50 values ranged from 0.35 mg/l at 30C for the emerald shiner to 3.00 mg/l at 10C for the bluegill. Based on their overall resistance to monochloramine the fish were separated into 'sensitive' and 'resistant' emerald shiner, spotfin shiner, common shiner, channel catfish, white sucker, and sauger had 30C LC50 values ranging from 0.35 to 0.71 mg/l. 'Resistant' species, freshwater drum, white bass, bluegill, and carp, had LC50 values of 1.15-1.50 mg/l at 30C. The time to mortality was species and temperature dependent. Generally sensitive, species died earlier during the exposure regime than did resistant species. Fish also died more rapidly at higher test temperatures. Fish rarely recovered following their initial loss of equilibrium. The concentrations which produced no mortality were used to calculate safe levels for each species. Based on these calculations to protect the most sensitive species average monochloramine exposures should not exceed 0.2 mg/l for a period not to exceed 160 min/day. (EIS-Katz)
W78-11544

NITROGEN TRANSFORMATIONS WITHIN THE TROPHOGENIC ZONE OF LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
C. F.-H. Liao, and D. R. S. Lean.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 1102-1108, 1978. 2 fig., 6 tab., 19 ref.

Descriptors: *Trophic levels, *Nitrogen cycle, *Ammonia, Nitrogen compounds, Nitrogen fixation, Nitrate, Zooplankton, Absorption, Nutrients, Productivity, Plankton, Chemical reactions, Seasonal, Primary productivity, *Limnocorrals, Bay of Quinte, Ontario.

The uptake rates for ammonia and nitrate were measured in limnocorrals and in the adjacent water in the Bay of Quinte, Ontario. Even though the net change of nitrate exceeds that for ammonia over the summer, it is ammonia that is the most significant source of N for the plankton. The uptake rates were light dependent; in the dark uptake of nitrate was reduced 60-95% and ammonia by 40-70%. The uptake of N is not correlated with sedimentation, N release by zooplankton excretion, and N2-fixation. Although N2-fixation provides only a small amount of the daily N requirement compared with ammonia uptake, ammonia is rapidly recycled and the N2-fixation is the vital process controlling the amount of this essential nutrient in systems where it is in short supply (corral II). Zooplankton grazing and sedimentation (decomposition) can account for much of the ammonia regeneration but direct release of ammonia from the plankton appeared to be important. (EIS-Deal)
W78-11545

STRESS RESPONSE OF COHO SALMON (ONCORHYNCHUS KISUTCH) ELICITED BY CADMIUM AND COPPER AND POTENTIAL USE OF CORTISOL AS AN INDICATOR OF STRESS,
Oregon Cooperative Fishery Research Unit, Corvallis.
C. B. Schreck, and H. W. Lorz.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 1124-1129, 1978. 3 fig., 3 tab., 17 ref.

Descriptors: *Fish physiology, *Sockeye salmon, Salmonids, Toxicity, *Copper, *Cadmium, Metals, Heavy metals, Resistance, Fish diseases, Juvenile growth stages, Mortality, Animal metabolism, Stress, *Cortisol, General adaptation syndrome, Coho salmon.

Exposure of juvenile coho salmon to copper (Cu) produced a marked, dose-dependent serum cortisol elevation. Treatment with cadmium (Cd) did not elicit a cortisol elevation, even in moribund fish. Stressing salmon with sublethal levels of Cu or handling plus close confinement resulted in 'ideal' compensation (return to prestress levels) in cortisol titers. Salmon exposed to Cu had depressed serum chloride levels and reduced survival when challenged with salt water. Exposure to Cd did not influence serum chloride or the ability to tolerate salt water. Handling and close confinement produced the same cortisol elevation in controls as in Cu- or Cd-treated fish, but exposure to Cu reduced the ability of the fish to survive the stress of handling and confinement. Cortisol level and other characteristics of the General Adaptation Syndrome of stress should not be universally applied as indicators of stress in salmon. (EIS-Deal)
W78-11546

DETERMINATION OF VOLATILITY AND CHEMICAL PERSISTENCE OF LIPID-SOLUBLE HALOGENATED ORGANIC SUBSTANCES IN MARINE ORGANISMS,
Central Inst. for Industrial Research, Oslo (Norway).
For primary bibliographic entry see Field 5A.
W78-11548

SIX POLLUTED LAKES: A PRELIMINARY EVALUATION OF THE TREATMENT AND RECOVERY PROCESSES,
Uppsala Univ. (Sweden). Algal Assay Lab.
For primary bibliographic entry see Field 5G.
W78-11549

DDT AND PCB LEVELS AND REPRODUCTION IN RINGED SEAL FROM THE BOTHNIAN BAY,
Oulu Univ. (Finland). Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-11550

DAPHNIA MAGNA AS A BIOASSAY SYSTEM FOR HISTAMINE IN TUNA EXTRACTS,
California Univ., Davis. Inst, of Marine Resources.
For primary bibliographic entry see Field 5A.
W78-11551

IONIZATION OF AMMONIA IN SEAWATER: EFFECTS OF TEMPERATURE, PH, AND SALINITY,
Sea Research Foundation, West Hartford, CT. Inst. for Aquarium Studies.
C. E. Bower, and J. P. Bidwell.
Journal of the Fisheries Research Board of Canada, vol. 35, p1012-1016, 1978. 5 tab, 19 ref.

Descriptors: *Toxicity, *Ammonia, *Ionization, Chemical reactions, Water temperature, Salinity, Hydrogen ion concentration, Sea water, Marine fish, Water chemistry, Chemical analysis, Nitrogen compounds.

Previous studies have shown that the toxicity of ammonia to freshwater fishes depends on the ambient concentration of the un-ionized fraction (NH(3)) and have quantified the percent NH(3) in solution as a function of temperature and pH. If NH(3) is also toxic to marine fishes, the effect of salinity on the ionization of ammonia must also be considered. The percent NH(3) over ranges of temperature, pH, and salinity common in seawater-culture situations is presented here. (EIS-Deal)
W78-11553

LEAD ENRICHMENT IN SHELLS OF MYTILUS EDULIS,
Uppsala Univ. (Sweden). Dept. of Paleontology.

U. Sturesson.
Ambio, Vol. 5, No. 5-6, p253-256, 1976. 1 tab, 4 fig, 23 ref.

Descriptors: *Mussels, *Lead, *Path of pollutants, *Absorption, *Shellfish, *Bioindicators, Mollusks, Invertebrates, Metals, Heavy metals, Carbonates, Adsorption, Laboratory tests, Analytical techniques, *Bioconcentration, *Periostracum.

The enrichment of lead in the shells of Mytilus edulis has been studied. The animals were bred in tanks with seawater, spiked with lead at concentrations of 0, 0.02, 0.10, and 0.50 microgram PB/g seawater. The shells were fractioned into periostracum, calcitic/aragonitic calcium carbonate and intercrystalline organic matrix. The samples were analyzed with the differential pulse anodic stripping technique (DPAS). All of the examined fractions were found to concentrate lead; the highest values were found in older parts of the periostracum and in the newly formed calcium carbonate. (EIS-Katz)
W78-11554

PCB LEVELS CORRELATED WITH PATHOLOGICAL CHANGES IN SEAL UTERI,
Oulu Univ. (Finland). Dept. of Zoology.
E. Helle, M. Olsson, and S. Jensen.
Ambio, Vol. 5, No. 5-6, p261-263, 1976. 3 fig, 3 tab, 12 ref.

Descriptors: *Reproduction, *Animal pathology, *Polychlorinated biphenyls, *Pesticides, *Marine animals, *Mammals, *Sterility, Animal physiology, Pathology, Chlorinated hydrocarbon pesticides, Populations, DDT, Water pollution effects, *Baltic Ringed Seals, *Baltic Sea.

About 40 percent of a sample of Baltic ringed seal females of reproductive age showed pathological changes of the uterus. The uterine hormones were closed by stenosis and occlusions, preventing any passage from the ovary out through the horn. This explains their low reproduction rate. Animals showing these changes had significantly higher levels of DDT and PCB substances than normal, pregnant females. These pathological changes were also found aong grey seal from the Baltic area, as well as among harbor seal from the Swedish west coast. It is strongly indicated that PCB is responsible for the reproductive failure of seals in the Baltic area. A significant positive correlation between DDT and PCB levels and age was found in the males but not in the females. The levels of DDT and PCB substances were somewhat lower in fetuses, than in their mothers. (EIS-Katz)
W78-11555

GROWTH OF MYTILUS EDULIS L. IN A WASTE RECYCLING AQUACULTURE SYSTEM,
Woods Hole Oceanographic Institution, MA.
R. Mann.
Aquaculture, vol. 13, p351-354, 1978. 1 fig, 3 ref.

Descriptors: *Aquiculture, *Mussels, *Commercial shellfish, Environmental effects, *Sewage, *Growth rates, Waste water disposal, Mortality, Nutrients, Recycling, Mollusks, Invertebrates, Shellfish, Laboratory tests, Water temperature, Public health, Sewage effluents, *Waste recycling.

The mussel Mytilus edulis was grown in a waste recycling aquaculture system at 14C on a diet of Phaeodactylum tricornutum and Skeletonema costatum cultured in a 15% sewage-seawater mixture. Mussels exhibited a 116% increase in mean live weight (5.5 to 11.9 g), a 718% increase in mean dry weight (0.11 to 0.90 g), and 4% mortality over a 28-week period. (EIS-Katz)
W78-11557

OXYGEN CONSUMPTION BY STICKLEBACKS (GASTEROSTEUS ACULEATUS L.) EXPOSED TO ZINC,
Queen Elizabeth Coll., London (England). Dept. of Biology.
A. E. Brafield, and P. Matthiessen.
Journal of Fish Biology, Vol. 9, No. 3, p 359-370, 1976. 9 fig., 26 ref.

Descriptors: *Respiration, Fish physiology, *Oxygen, *Sticklebacks, *Zinc, *Fish behavior, *Calcium, *Mortality, Environmental effects, Aquatic animals, Laboratory tests, Metabolism, Metals, Water quality, Hardness(Water), Lethal limit, Methodology, *Gasterosteus, *Sublethal effects.

The rate of oxygen consumption by stickle-backs has been studied by long-term continuous-flow respirometry. Exposure to 1 ppm zinc in calcium-free water causes wide variations in individual responses, but oxygen uptake tends to rise and then become extremely erratic, before declining as death approaches. Behavioral abnormalities such as increased ventilation rate, loss of balance, and long periods of inactivity alternating with spasmodic swimming also occur. Exposure to 6.5 ppm zinc in high-calcium water generally causes a rise in oxygen consumption, followed by fluctuations in the rate of uptake, but no behavioral abnormalities occur and deaths are rare even after exposure for 400 h. If restored to zinc-free water after 40 h exposure to zinc, recovery is generally complete, although fluctuating rates of oxygen uptake persist. These results are discussed in relation to previous work on the effects of heavy metals on fish respiration.
W78-11558

ANTHROPOGENIC SUBSTANCES IN SEAL FROM THE BALTIC: METHYL SULFONE METABOLITES OF PCB AND DDE,
Stockholm Univ. (Sweden). Wallenberg Lab.
S. Jensen, and B. Jansson.
Ambio, Vol. 5, No. 5-6, p 257-260, 1976. 4 fig, 16 ref.

Descriptors: *Polychlorinated biphenyls, *DDE, *Pesticide residues, *Mammals, *Marine animals, *Path of pollutants, *Analytical techniques, DDT, Chlorinated hydrocarbon pesticides, Metabolism, Methodology, Mass spectrometry, Reproduction, Water pollution effects, Pesticides, Halichoerus, Pusa, Phoca, Seals.

Methyl sulfone metabolites of PCB and DDE have been found in grey seal from the Baltic. This was accomplished using a new clean-up method in which the substances were extracted from 90 g of isolated fat by the means of acetonitrile. These hitherto unknown metabolites are soluble in concentrated sulfuring acid, which could be used for their isolation. The concentrations of the sulfones of DDE and PCB in seal blubber were estimated to be 4 and 16 ppm, respectively. The metabolic origin of these substances was verified by mink fed with DDE and PCB. (EIS-Katz)
W78-11559

THE EFFECTS OF 1973 SPRING FLOODWATERS ON OYSTER POPULATIONS IN LOUISIANA,
Louisiana Wildlife and Fisheries Commission, New Orleans, LA.
R. J. Dugas, and W. S. Perret.
In: Proceedings of the 29th Annual Conference of the South Eastern Association of Game and Fish Commissioners, October 12-15, 1975. p 208-214. 4 fig, 15 ref.

Descriptors: *Commercial shellfish, *Oysters, Environmental effects, *Floods, *Floodwater, *Mortality, Salinity, Sedimentation, Mollusks, Invertebrates, Water temperature, Public health, Suspended solids, *Louisiana, 1973 Spring Flood.

A total of 122,700 acres of leased oyster bottoms were adversely affected by the floodwaters of 1973. This represented 68 percent of the leased oyster grounds in Louisiana. Additionally, much of the public natural 'Oyster Seed Grounds' were subjected to unusually low salinities, siltation and vegetation overburden. This resulted in loss of a portion of the 1973 seed oyster crop. (EIS-Katz)
W78-11560

THE SALINITY TOLERANCE OF OPHIOTHRIX ANGULATA (SAY) (ECHINODER-MATA: OPHIUROIDEA) IN LATITUDINALLY SEPARATE POPULATIONS,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
S. E. Stancyk, and P. L. Shaffer.
Journal of Experimental Marine Biology and Ecology, Vol. 29, p 35-43, 1977. 2 fig., 20 ref.

Descriptors: *Salinity, *Crustaceans, *Resistance, *Animal populations, Environmental gradients, Environmental effects, South Carolina, Florida, Invertebrates, Populations, Distribution patterns, Animal physiology, Laboratory tests, Animal behavior, *Ophiothrix angulata, *Salinity tolerance.

Ophiothrix angulata from an estuary in South Carolina were less tolerant of reduced salinity than those from an estuary in Florida. Animals from North Inlet, South Carolina, became incapacitated more rapidly after exposure to a reduced salinity, and were less able to recover after return to normal salinity. This difference probably results from the more severe selection for salinity tolerance at Cedar Key, Florida. The Florida estuary has a lower average salinity (25 0/00) than that in South Carolina (30 0/00), and has more frequent extended periods of reduced salinity. The two populations are of different color varieties and size: there may be differences in the breeding seasons as well. The South Carolina and Florida populations of Ophiothrix angulata may represent different races. (EIS-Katz)
W78-11561

THE EFFECT OF HEATED EFFLUENT ON EGG PRODUCTION IN THE ESTUARINE PRAWN UPOGEBIA AFRICANA (ORTMANN),
Rhodes Univ., Grahamstown (South Africa). Dept. of Zoology and Entomology.
B. J. Hill.
Journal of Experimental Marine Biology and Ecology, Vol. 29, p 291-302, 1977. 3 fig., 3 tab., 13 ref.

Descriptors: *Reproduction, *Aquiculture, *Heated water, *Water temperature, *Shellfish, *Fecundity, Environmental effects, Animal behavior, Invertebrates, Crustaceans, Thermal powerplants, Temperature, Populations, Animal physiology, Fertility, Thermal pollution, Upogebia, Prawns.

Egg production of a population of Upogebia africana in a pond containing water heated by a thermal power station at Knysna, South Africa was compared with that of the population in the adjacent estuary and in two other estuaries. The breeding cycle, proportions of ovigerous females, incubation time for eggs at different temperatures, number of eggs produced, sex rations, and size-frequency of males and females were all investigated. The number of eggs produced/100 prawns was found to be nearly twice as high in the population exposed to heated effluent as compared with the population in the adjacent estuary. The increase was due to a combination of a change in sex ration resulting in more females in the population and a greater proportion of larger females in the pond. Since the number of eggs produced/female is positively related to the size of the prawn, large females in warmer water produced more eggs than smaller females in the adjacent estuary. Exposure to heated effluent did

not alter the initiation or duration of the breeding season, nor cause precocious maturity: nor did it alter the number of eggs carried per female at various sizes. (EIS-Katz)
W78-11562

TOXICITY OF POLYNUCLEAR AROMATIC HYDROCARBONS TO THE POLYCHAETE NEANTHES ARENACEODENTATA,
Texas A and M Univ., College Station. Dept. of Biology.
S. S. Rossi, and J. M. Neff.
Marine Pollution Bulletin, Vol 9, p 220-223, 1978. 1 fig, 2 tab, 20 ref.

Descriptors: *Aromatic compounds, *Toxicity, *Worms, Bioassay, Organic compounds, Solubility, Chemical analysis, Chemical reactions, Spectrophotometry, Path of pollutants, Animal physiology, Sea water, Mortality, Marine animals, *Polychaetes, *Neanthes, *Naphthalenes, Polynuclear aromatic hydrocarbons.

The toxicity of ten polynuclear aromatic hydrocarbons (PNAs) was studied in replicate 96 h bioassays with specific hydrocarbons in solution. PNA toxicity and residence time in test solutions were directly related to molecular weight (MW), while relative solubility is inversely related to MW. PNA toxicity appears to be related to both solubility and residence time in test solutions. (EIS-Deal)
W78-11563

EXPERIMENTAL STUDIES ON THE ACCUMULATION OF COPPER AND ZINC IN THE GREEN MUSSEL,
National Institute of Oceanography, Panjim (India).
C. D'Silva, and T. W. Kureishy.
Marine Pollution Bulletin, Vol 9, p 187-190, 1978. 3 fig, 2 tab, 21 ref.

Descriptors: *Copper, *Zinc, *Toxicity, *Mussels, Bioassay, Absorption, Spectrophotometry, Metals, Path of pollutants, Animal physiology, Animal behavior, Animal metabolism, *Bioaccumulation, *Mytilus, *Tissue analysis.

Toxicity of copper and zinc to the green mussel was evaluated by short-term bioassays. The rates of copper and zinc accumulation were determined by analysing the metal content in the soft parts of the mussels at fixed intervals of time by atomic absorption spectrometry. Bioaccumulation was determined as a function of metal concentration in the experimental medium. The correlations for the regression lines (P less than 0.1%) indicate that the uptake of metal is linear at least for the first five weeks. During a more extended experimental period, adjustment to a steady state probably occurs. (EIS-Deal)
W78-11564

IN SITU UPTAKE OF MERCURY BY THE INTERTIDAL MUSSEL, MYTILUS CALIFORNIANUS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-11565

ESTIMATION OF TOXICITY USING CULTURED MAMMALIAN CELLS OF THE ORGANIC POLLUTANTS RECOVERED FROM LAKE BIWA,
Kyoto Inst. of Public Health (Japan).
S. Maruoka.
Water Research Vol. 12, 1978, p 371-375, 1 tab., 4 fig., 17 ref.

Descriptors: *Bioassay, *Toxicity, *Public health, Water pollution effects, *Methodology, Chemical analysis, Organic wastes, *DDT, Laboratory tests, Monitoring, *Lake Biwa(Japan), *Cultured mammalian cells, Organic pollutants, Seasonal variation.

Cultured mammalian cells were used to examine the toxicity of the organic pollutants present in Lake Biwa. The pollutants were adsorbed on activated carbon and extracted respectively with methylene chloride, chloroform, acetone, and ethanol. It was found that the toxicity of the extracted organic pollutants varied markedly with the solvent used. The results herein suggest that substances extractable with methylene chloride are most important for estimating the organic pollution in aquatic environments. The conspicuous seasonal variation in the toxicity, as well as the concentration, of methylene chloride and chloroform extractable substances was marked.
W78-11566

THE EFFECT OF HEATED EFFLUENTS FROM POWERPLANTS ON SEAGRASS (THALASSIA) COMMUNITIES QUANTITATIVELY COMPARING ESTUARIES IN THE SUBTROPICS TO THE TROPICS,
Miami Univ. FL. Dept. of Microbiology.
A. Thorhaug, N. Blake, and P. B. Schroeder.
Marine Pollution Bulletin, Vol. 9, No. 7, p 181-187, 1978. 3 tab., 4 fig., 21 ref.

Descriptors: *Water temperature, Thermal properties, *Estuaries, Effluent streams, *Tropical regions, *Marine algae, Water pollution effects, *Thermal stress, Thermal water, Thermal pollution, Gulf of Mexico, Plant grouping, Florida, Puerto Rico, Caribbean, Guayanilla Bay, Turkey Point, Card Sound, Tampa Bay, Thalassia.

The need for most efficient use of energy is abruptly in conflict with the need to maintain environmental quality in terms of heated effluents released from power plants. This study synthesizes biological results found from four effluent canals from power plants releasing heat on shallow estuaries: tropics, edge of tropics and subtropics. The dominant near-shore community in the Gulf of Mexico and Caribbean is that of Thalassia, rich in animal and plant abundance and biomass. Summer mean temperatures in all three estuaries ranged around 30C. Results show sustained temperatures of +5C in summer denude the area of the Thalassia community. Temperatures +1 and +1.5C were minimally damaging to the studied areas and can be considered rational release temperatures. Insufficient data was available at +2C to make a statement; +4C areas showed intense damage to the biological communities at all locations; +3C effect varied from severe damage in the subtropics to 40% damage in the tropics. Recommended summer heated effluents release for power plants eliminating heat onto Thalassia beds would certainly never be greater than +3C. A trade-off decision must be made by decision-makers as to +3 or +2C as the upper permissable limit. Winter release of effluent temperature in areas where winter temperatures fall below 25C could be above +3C apparently with damage. Tropical and subtropical ecosystems are on the brink of disaster and small increments of change by man's activities can push them beyond tolerance limits. Evidently the marine tropics differ from marine temperate zones in thier capacity to assimilate man's activities. (EIS)-Katz)
W78-11568

HEAVY METALS IN THE BURROWING BIVALVE SCROBICULARIA PLANA FROM CONTAMINATED AND UNCONTAMINATED ESTUARIES,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
G. W. Bryan, and L. G. Hummerstone.
Journal of the Marine Biological Association of the United Kingdom, vol. 58, 1978, p401-419. 6 tab, 7 fig, 9 ref.

Descriptors: *Metals, Silver, Cadmium, Cobalt, Chromium, Copper, Iron, Manganese, Nickel, Lead, Zinc, Molluscs, Benthos, Marine animals, Path of pollutants, Mine wastes, Water pollution, Effects, Bioindicators, Sediments, *Heavy metals, *Scrobicularia, *Gannel estuary, *Camel estuary, England.

Concentrations of ten metals (Ag, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, Zn) have been analysed in the soft tissues of Scrobicularia plana (da Costa) from sites in the Gannel and Camel Estuaries in South-West England. In the Gannel Estuary, which receives wastes from old lead mines, the animals contained about an older of magnitude higher concentrations of lead, cobalt, cadmium, and zinc than in the Camel Estuary and higher concentrations of other metals also. Differences were also observed between the sediments. In both populations, less than 50% of the total silver, copper and iron was found in the digestive gland. For the other metals over 50% occurred in this organ, and in large gannel animals, more then 90% of the lead, cobalt, cadmium and zinc, implying that they are chiefly absorbed from ingested sediment. (EIS-Katz)
W78-11570

PERIPHYTON BIOMASS OF ATTACHED ALGAE AND BIOLOGICAL ESTIMATION OF WATER POLLUTION LEVEL USING ATTACHED DIATOMS IN THE CHIKUMA RIVER AND ITS TRIBUTARY, NAGANO PREFECTURE (IN JAPANESE),
Freshwater Fisheries Research Lab. Tokyo (Japan).
Y. Furuta, K. Tanaka, and T. Ito.
Bulletin of the Freshwater Fisheries Research Laboratory, vol 27, no 2, 1977, p63-73. 4 fig, 2 tab, 5 ref.

Descriptors: *Periphyton, *Algae, *Nutrients, Water pollution effects, Domestic wastes, Sewage, Water quality, *Biomass, Rivers, Path of pollutants, On-site investigations, Diatoms, *Saprobicity, Benthic diatoms, Attached algae, *Japan, *Chikuma River, *Kakuma River, Intolerant species, Tolerant species.

In the Chikuma and Kakuma Rivers, the periphyton biomass of attached algae was observed to be most abundant at stations where domestic sewage was discharged into the rivers. In the Chikuma River, abundant periphyton biomass of the algae was observed also at the mouth of a channel from a small impoundment near the river. The situation was nearly the same with the individual number of attached algae. In the Kakuma River, organic pollution has begun at the placed where domestic sewage is discharged into the river. In the Chikuma River, pollution was observed at the mouth of a canal from an impoundment near the river. At about 6 km downstream however, the water was less polluted, and again, pollution increased further downstream near Ueda City. (EIS-Katz)
W78-11571

CONTROL OF THE BIOLOGICAL AVAILABILITY OF TRACE METALS TO A CALANOID COPEPOD IN A COASTAL FJORD,
British Columbia Univ., Vancouver. Inst. of Oceanography.
P. H. Whitfield, and A. G. Lewis.
Estuarine and Coastal Marine Science, vol. 4, no. 2, p255-266, 1976. 3 tab, 4 fig, 26 ref.

Descriptors: *Trace metals, *Copepods, *Chelation, *Bottom sediments, Environmental effects, *Fjords, *Immature growth stage, Trace elements, Organic matter, Water purification, Pollutants, Path of pollutants, Crustaceans, Invertebrates, Zooplankton, Laboratory tests, Copper, Metals, Zinc, Manganese, Euchaeta, *EDTA, *Photo-oxidation, *Indian Arm(British Columbia).

Organic material present in natural waters and in sediments was found to act in a manner which waters the availability of trace metals to the prefeeding stages of a calanoid copepod (Euchaeta japonica). In the laboratory, survival of the organism was found to decrease with a decrease in the amount of u.v. photo-oxidizable material. Replacement of the material with a known chelation agent (ethylenediaminetetraacetic acid; EDTA) increased survival. Comparison of survival in untreated water with that in different EDTA concentrations provided an EDTA equivalent value which was used to indicate the natural complexing ability fo the water. an EDTA equivalent value was also obtained for salt-water extracts of bottom sediments. Examination of a coastal fjord over a year indicates that the natural complexing ability of the deep water increases after a major intrusion of deep water and decreases with increasing residence time of the water. In contrast, the complexing ability of saltwater extractable material in bottom sediments appears to be dependent upon nearsurface productivity. (EIS-Katz)
W78-11572

AN EVALUATION OF THE EFFECT OF DRAWDOWN ON THE TROPHIC STATUS OF A SMALL RESERVOIR,
Georgia Coll., Milledgeville. Center for Environmental Study and Planning.
For primary bibliographic entry see Field 5G.
W78-11576

DETERGENT PHOSPHATE BAN.
Environmental Protection Agency, Chicago, IL. Phosphorus Committee.
For primary bibliographic entry see Field 5G.
W78-11581

NITROGEN FIXATION WITH PHOTOSYNTHETIC MARINE MICROORGANISMS; SIX MONTHS RESEARCH PROGRESS REPORT,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL. Div. of Biology and Living Resources.
A. Mitsui.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 269, Price codes: A02 in paper copy, A01 in microfiche. Report NSF/RA-770293, 1977. 21 p, 2 fig, 5 tab. AER 76-17159.

Descriptors: *Photosyntheses, *Nitrogen fixation, *Marine microorganisms, *Cyanophyta, *Aquiculture, Tropical regions, Caribbean Sea, Florida, Oceans, Marine algae, Solar radiation, Nitrogen, Algae, Fertilizers, Foods.

Six month's progress is reported for a project to develop a mass culturing system for nitrogen-fixing marine photosynthetic microorganisms, potentially applicable to commercial food and fertilizer production without expenditure of nonrenewable resources. The research plan consists of: (1) collecting marine photosynthetic organisms in the tropical Caribbean and south Florida areas characterized by high species diversity; (2) isolating and culturing individual species, with determination of nitrogen-fixing species; (3) testing selected isolates for growth and nitrogen-fixing capabilities under ideal conditions; (4) biochemical evaluation of the isolates for applicability as a source of food and fertilizer; tests will include measures of protein, carbohydrate, lipid, vitamin, and mineral content; and (5) designing a pilot plant and determining economic feasibility of widespread utilization. Collection of marine blue-green algae has proceeded as scheduled. Photosynthetic nitrogen-fixing cultures have been established which display wide morphological diversity, in many cases coupled with fast growth rates in combined nitrogen-free medium. Dominant algal growths in the nitrogen-free cultures are filamentous and colonial cyanophytes. Each salinity/pH combination tested proved optimal for at least one algal strain. (Lynsh-Wisconsin)
W78-11582

THE QUANTITATIVE STIMULATION OF PHYTOPLANKTON PRODUCTIVITY BY DEEP WATER ADMIXTURE IN A COASTAL INLET,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
T. Platt, D. V. Subba Rao, and K. L. Denman.
Estuarine and Coastal Marine Science, Vol 5, No 5, p 567-573, 1977. 3 fig, 1 tab, 23 ref.

Descriptors: *Phytoplankton, *Primary productivity, *Upwelling, *Eutrophication, *Mixing, *Bottom water, *Laboratory tests, Deep water, Inlets(Waterways), Bedford Basin(Nova Scotia Canada), Nova Scotia(Canada), Canada, Coasts, Biomass, Chlorophyll, Nutrients, Inorganic compounds, Algae, Carbon radioisotopes, Skeletonema costatum, Ultraflagellates, Diatoms, Dinoflagellates, Chelation, Organic compounds.

Surface seawater samples from Bedford Basin (Nova Scotia, Canada) were enriched with bottom water from 65 m depth at concentrations of 0, 0.25, 0.5, 0.75, 1.0, 1.5, and 2.0% to measure effects on surface primary productivity. Optimal enrichment was 0.75%, suggesting that newly upwelled water might not naturally sustain maximum productivity until it is diluted about 100-fold, estimated to require about 10 days. It is hypothesized that newly upwelled water contains some inhibitory factor related to chelation, the effect of which is diminished by dilution. Silicate is known to behave this way under certain circumstances. Inorganic nutrients measured in this study did not constitute the stimulatory factor; the growth factor could be cancelled by shaking with activated charcoal. This and earlier studies indicate that calculation of the potential stimulation of primary production by artificial upwelling is more subtle than has been supposed. It is not sufficient to account for inorganic enrichment only; the effect of added organic compounds may be of equal or greater importance. At 0.75% enrichment a 4-fold increase in carbon-14 uptake rate and a 1.4-fold increase in the productivity-to-biomass ratio occurred. It is likely that stronger stimulation of phytoplankton would have resulted if surface waters were lower in inorganic nutrients. Unidentified ultraflagellates numerically dominated all enriched cultures. (Lynch-Wisconsin)
W78-11583

ASSIMILATION OF CO2 IN THE DARK COMPARED TO PHYTOPLANKTON PRODUCTION IN A SMALL COASTAL INLET,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Fisheries and Marine Service.
S. Taguchi, and T. Platt.
Estuarine and Coastal Marine Science, Vol. 5, No. 5, p 679-684, 1977. 3 fig, 1 tab, 13 ref.

Descriptors: *Phytoplankton, *Primary productivity, *Dark, *Carbon dioxide, *Absorption, *Photosynthesis, *Inlets(Waterways), *Estuarine environments, Coasts, Carbon fixation, Eutrophication, Bedford Basin(Nova Scotia Canada), Nova Scotia(Canada), Canada, Diurnal, Annual, Seasonal, Adenosine triphosphate, Depth, Estuaries.

Photosynthetic production and dark assimilation of carbon dioxide-14 were measured October 1973-December 1974 in Bedford Basin (Nova Scotia, Canada), a small nutrient-enriched coastal inlet, to compare relative magnitudes of light and dark fixation of carbon averaged over a year. Sampling was carried out biweekly at a station with a depth of 70 m. CO2-14 dark assimilation varied from 20% (summer) to 200% (winter) of assimilation in the light. Annual dark CO2 fixation was estimated at 50 g c/sq m/year (with standard deviation of seven g C/sq m/year), or about 25% of the estimated annual photosynthetic production of 200 g C/sq m/year. Maximum dark assimilation was 41.3 mg C/cu m/day (in July at 2.5 m). Differences between dark and light assimilation include: (1) Dark uptake varies much less with depth than does photosynthesis as the former is independent of the vertical gradient of light and responsible organisms are apparently distributed throghout the water column; results for adenosine triphosphate are consistent with this conclusion. (2) Dark uptake in Bedford Basin is less seasonal than photosynthetic production; dark uptake varied five-fold during the year, compared with a ten-fold variation for photosynthetic assimilation. Photosynthetic and dark fixation are not necessarily independent phenomena; organisms from the illuminated zone enclosed in dark bottles may respond with light-initiated dark reactions, which could account for a proportion of the apparent dark uptake. (Lynch-Wisconsin).
W78-11584

A SEASONAL STUDY OF THE DISTRIBUTIONS OF SURFACE STATE VARIABLES IN LIVERPOOL BAY. I. WINTER DATA,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5B.
W78-11585

ENVIRONMENTAL IMPACTS OF MECHANICAL HARVESTING OF SUBMERSED VASCULAR PLANTS,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5G.
W78-11586

SEASONAL PERIODICITY OF DIATOMS, AND SILICON LIMITATION IN OFFSHORE LAKE MICHIGAN, 1975,
Argonne National Lab., IL. Radiological and Environmental Research Div.
J. I. Parker, H. L. Conway, and E. M. Yaguchi.
Journal of Fisheries Research Board of Canada, Vol. 34, No. p 552-558, 1977. 4 fig, 25 ref.

Descriptors: *Lake Michigan, *Diatoms, *Eutrophication, *Silicon, *Limiting factors, *Seasonal, Periodicity, Lakes, Great Lakes, Algae, Phytoplankton, Biomass, Nutrients, Cycling nutrients, Plant growth, Pigments, Primary productivity, Chlorophyll, Euphotic zone.

A critical silicon concentration of about 6.5 micromols/liter may control the development and timing of offshore diatom populations in Lake Michigan. Samples were collected on monthly cruises January-December 1975. Diatom biomass maxima occurred in spring and fall, producing a bimodal sequence. The May maximum was preceded by rapid growth as indicated by increased values of primary productivity and pigment concentration. As the spring bloom progressed, decreasing nutrient levels apparently slowed diatom growth; the diatom biomass accumulation rate declined, assimilation quotients were minimal, and soluble reactive silicon was reduced from 13 to 6.8 micromols/liter. In summer, following the bloom, diatom biomass and silicon reached seasonal minima of < 250 mg C/sq m and about 1.0 micromols/liter respectively. Diatom biomass increased again in October when silicon supplies were replenished and the concentration exceeded 6.6 micromols/liter, indicating that the fall diatom bloom is regulated by the restoration of dissolved reactive silicon concentrations in the euphotic zone to the level of the limiting concentration. Restoration of available silicon is dependent upon dissolution of amorphous silica and redistribution of dissolved silicon from deeper water into the euphotic zone. (Lynch-Wisconsin)
W78-11587

DISSOLUTION OF DIATOM FRUSTULES AND RECYCLING OF AMORPHOUS SILICON IN LAKE MICHIGAN,
Argonne National Lab., IL. Radiological and Environmental Research Div.
J. I. Parker, H. L. Conway, and E. M. Yaguchi.
Journal of Fisheries Research Board of Canada, Vol. 34, No. p 545-551, 1977. 5 fig, 3 tab, 18 ref.

Descriptors: *Lake Michigan, *Diatoms, *Frustules, *Silicon, *Recycling, *Eutrophication, *Sediments, Algae, Phytoplankton, Great Lakes, Lakes, Sedimentation, Sediment traps, Dissolution, Nutrients, Cycling nutrients.

Use of a sediment core and sediment traps in Lake Michigan southwest of Grand Haven, Michigan, 13.5 km offshore to measure the concentration of diatom frustules and amorphous silicon suggests that recycling of biogenic silicon provides the major source of soluble reactive silicon required for diatom blooms in Lake Michigan. Traps were anchored 37 and 60 m deep; the concentration of frustules and silicon was measured per gram dry sediment at five-m intervals in the upper water column (0-40 m). An average concentration of 314 million frustules per gram of dry suspended sediment in the water column was measured. The average for the 37-m trap sample was 116 million frustules/g dry sediment, and for the 60-m sample, 50.3 million. Subsamples from the sediment core averaged 6.31 million frustules/g dry surficial sediment. The average proportion of amorphous silicon/g dry sediment was 8.6% in the water column, 7.7% in the 37-m traps, 6.0% in the 60-m traps, and < 2.0% in the sediment core subsamples. The major fraction of amorphous silicon produced annually as diatom frustules was decomposed before incorporation in the permanent sediment. Comparison of the annual silicon requirement for diatom production and silicon inputs showed the watershed contributes under 5% of the dissolved reactive silicon required for annual diatom production. (Lynch-Wisconsin)
W78-11588

THE SPECIES DIVERSITY, NUMBERS AND BIOMASS OF BENTHIC NEMATODES IN CENTRAL PART OF LAKES WITH DIFFERENT TROPHY,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
K. Prejs.
Ekologia Polska, Vol. 25, No. 1, p 31-44, 1977. 4 fig, 4 tab, 23 ref.

Descriptors: *Trophic level, *Species diversity, *Abundance, *Biomass, *Nematodes, *Profundal zone, *Lakes, Poland, Canada, Norway, Lake Mikolajskie(Poland), Lake Zarnowieckie(Poland), Char Lake(Canada), Diversity indices, Dissolved oxygen, Oligotrophy, Dystrophy, Eutrophication, Depth, Benthic fauna, Faunal lists, Shannon diversity index.

A study of benthic nematodes in the central parts of 17 Polish, Canadian, and Norwegian lakes of different trophic levels showed greatest abundance, biomass, and number of species in oligotrophic Lakes Zielony Gasienicowy (Poland) and Char (Canada), and lowest in very eutrophic and dystrophic lakes. A correlation (r=0.84) was found between species diversity and lake trophic level; as water quality decreased from oligotrophy to eutrophication, species diversity expressed by the Shannon index (H) decreased. Three groups of lakes with similar species composition were distinguished: (1) oligotrophic Tatra lakes, (2) lowland lakes with advanced eutrophication and dystrophy, and (3) mesotrophic and moderately eutrophic lakes. Tobrilus gracilis and Monhystera paludicola were the most common species in the profundal zone of highly eutrophic and dystrophic lakes. It is assumed that low oxygen concentrations in near-bottom waters is a major factor limiting nematode distribution in the profundal zone of eutrophic lakes. Analysis of nematode groupings showed that species diversity can be used for evaluation of trophic level, and can even constitute an index of the lake degradation process. The study centered on Lakes Mikolajskie, Zarnowieckie, and Char, with Lake Mikolajskie studied most intensively. Field studies were carried out in summer, primarily in July. (Lynch-Wisconsin)
W78-11589

THE NEMATODES OF THE ROOT REGION OF AQUATIC MACROPHYTES, WITH SPECIAL CONSIDERATION OF NEMATODE GROUPINGS PENETRATING THE TISSUES OF ROOTS AND RHIZOMES,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
K. Prejs.
Ekologia Polska, Vol. 25, No. 1, p 5-20, 1977. 3 fig, 8 tab, 24 ref.

Descriptors: *Nematodes, *Roots, *Rhizomes, *Macrophytes, *Lake Mikolajskie(Poland), Lakes, Poland, Littoral, Aquatic plants, Hirschmanniella, Chrysonemoides, Dorylaimoides, Dorylaimus, Mesodorylaimus, Potamogeton perfoliatus, Potamogeton lucens, Sagittaria sagittifola, Nuphar luteum.

Investigation of nematodes in the littoral of Lake Mikolajskie, Poland, during 1972-74, emphasizing those inhabiting and penetrating the roots and rhizomes of aquatic macrophytes, indicated a specific grouping associated with the root region. Nematodes in the genera Hirschmanniella, Chrysonemoides, Dorylaimoides, Dorylaimus, Mesodorylaimus, Plectus, Panagrolaimus, Chronogaster, and Chromadorita are the most numerous and permanent inhabitants of root and rhizome tissues; the first five are apparently the only ones that utilize plant tissues as a direct food. The four plant species studied were Potamogeton perfoliatus, P. lucens, Sagittaria sagittifolia, and Nuphar luteum; the contribution of underground parts to total biomass was estimated. The average number of nematodes penetrating the tissues of roots and rhizomes was 39-413 individuals in 10 g fresh wt of P. perfoliatus, and 54-106 for P. lucens. In decomposing rhizomes and in their fragments with necrotic spots, high numbers of Hirschmanniella gracilis, Chrysonemoides limigenus, Dorylaimoides ditleuseni, and members of the family Dorylaimidae were found, many more than in fresh rhizomes. Nematodes probably invade plants through various surface wounds caused by mechanical destruction of the root and rhizome surfaces, and the animals spread actively inside the rhizomes from older parts to young, growing ones. (Lynch-Wisconsin)
W78-11590

PROCEEDINGS, RESEARCH PLANNING CONFERENCE ON THE AQUATIC PLANT CONTROL PROGRAM, 19-22 OCTOBER 1976, ATLANTIC BEACH, FLORIDA.
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 5G.
W78-11591

AQUATIC PLANT CONTROL PROGRAM--MOBILE DISTRICT--1976,
Army Engineer District, Mobile, AL.
M. J. Eubanks.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 39-41, 1 tab.

Descriptors: *Aquatic weed control, *Florida, *Louisiana, *Water hyacinth, Army Engineer South Atlantic Division, U. S. Army Engineer Mobile District, *Aquatic Plant Control Program, Eichhornia crassipes, Eurasian water milfoil, Myriophllum spicatum, Hydrilla, Giant cutgrass, Lake Seminole(FL GA), Eutrophication, Water pollution effects.

Aquatic plant control programs in the Mobile District of the U.S. Army Engineer South Atlantic Division are described. The district includes most of Alabama and parts of neighboring states, and contains six major river basins: Alabama-Coosa, Black Warrior and Tombigbee, Pascagoula, and Pearl. Major problem plants are: (1) water hyacinth (Eichhornia crassipes), (2) Eurasian water milfoil (Myriophyllum spicatum), (3) giant cutgrass, and (4) hydrilla. The most affected area of concentration is Lake Seminole (Florida and Georgia); other major problem areas are in Florida and Louisiana. Water hyacinth have infested about 7215 acres in the district, 3515 in Florida (not including Lake Seminole), 2100 in Louisiana, 800 in Lake Seminole, 500 in Alabama, 200 in Georgia, and 100 in Mississippi. Of 9000 acres of Eurasian water milfoil, 8000 are in Lake Seminole; the lake also contains 4500 acres of giant cutgrass. Of the 2000 acres of hydrilla, 1000 are in Lake Seminole and 1000 are in Lake Jackson, Florida. Four control programs (Louisiana, Georgia, Florida, and Tennessee) are in operation under the 1965 Cooperative Program Law, and two more are planned for Alabama and Mississippi. Flat-bottomed boats with boomless sprayers are generally used. (See also W78-11591) (Lynch-Wisconsin)
W78-11598

RESUME--AQUATIC PLANT CONTROL PROGRAM, WILMINGTON DISTRICT,
Army Engineer District, Wilmington, NC.
O. H. Johnson, Jr.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 49-51.

Descriptors: *Army Engineer Wilmington District, *North Carolina, *Alligatorweed, *Eurasian water milfoil, *Aquatic weed control, *Aquatic plant control program, Myriophyllum spicatum, Alternanthera philoxeroides, Biocontrol, Chemcontrol, 2-4-D, Alligatorweed flea beetle, Agasicles hygrophila, Herbicides.

The extent of infestations by alligatorweed (Alternanthera philoxeroides) and Eurasian water milfoil (Myriophyllum spicatum) in the Wilmington District of the U.S. Army Engineer South Atlantic Division is described, as well as measures for plant control. At present the primary problem is water milfoil; the scattered alligatorweed growths are no longer considered of major concern. However, even in regard to water milfoil no U. S. Army Corps of Engineers navigational projects are affected, nor are commercial or recreational high-use areas. Small boat owners, recreationists, shoreline residents, and some fishermen are those primarily inconvenienced. Little local concern or interest has been expressed, and the political future of control measures is uncertain. Limited chemical control efforts with 2,4-D were made in 1968, 1971, and 1974 with good results, but clearing lasted no more than three years. Water milfoil first appeared in 1965 in northeastern North Carolina in large, freshwater Currituck Sound, eventually covering 100,000 acres. In the early 1960s alligatorweed was the major aquatic plant problem, and it continues to infest drainage canals, small lakes, ponds, and streams in the coastal plains. Chemical control work was begun in 1960, and in 1967 releases of the alligatorweed flea beetle (agasicles hygrophila) were begun. Although the beetle successfully overwintered, the climate prevents sufficient buildup for significant control. (See also W78-11591) (Lynch-Wisconsin)
W78-11601

AQUATIC PLANT CONTROL IN THE CHARLESTON DISTRICT,
Army Engineer District, Charleston, SC.
J. L. Carothers.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on

the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 53-54.

Descriptors: *Alligatorweed, *Charleston district, *South Carolina, *Brazilian elodea, *Aquatic weed control, *Biocontrol, *Aquatic plant Control program, Army engineer Charleston district, Egeria densa, Alternanthera philoxeroides, Alligatorweed flea beetle, Agasicles hygrophila, Stem borer, Vogtia malloi, Chemcontrol, Herbicides, Silvex, 2-4-D, Santee-Cooper project(SC), Diquat, Lake Moultrie(SC), Lake Marion(SC), Eutrophication, Water pollution effects.

Brazilian elodea (Egeria densa) is currently the major aquatic plant problem in South Carolina public waters, while alligatorweed (Alternanthera philoxeroides), formerly a serious problem, has recently diminished so that no spraying was necessary in 1976. Notable elodea infestations occur in Lake Marion, the upper Cooper River and tributaries, and abandoned rice fields. Elodea, first reported in Lake Marion in 1965, had infested 10,000-20,000 acres by 1974. The only large-scale elodea control efforts were conducted in 1974 and 1975 on Lake marion with ortho diquat; treatment was effective only for a short time, followed by reinfestation and spreading to new areas. A management plan for aquatic plant control in Lakes Marion and Moultrie, which constitute the Santee-Cooper hydroelectric project, is under development. The first cooperative control program of the Charleston District of the U.S. Army Engineer South Atlantic Division, signed in 1960 and terminated in 1967, involved the South Carolina Public Service Authority (PSA). The current program with the South Carolina Department of Agriculture was begun in 1967; both programs have been directed exclusively at alligatorweed. The alligatorweed flea beetle (Agasicles hygrophila) proved more successful than the stem borer (Vogtia malloi). Herbicides have been used when needed. Under the 1960 contact the PSA provided manpower and equipment while the Federal Government furnished up to 70% of required funds and herbicides (granular Silvex and 2,4-D). (See also W78-11591) (Lynch-Wisconsin)
W78-11602

RESPONSE OF HYDRILLA TO VARIOUS HERBICIDES,
Texas Parks and Wildlife Dept., San Antonio. State Wide Noxious Vegetation Control Program.
For primary bibliographic entry see Field 5G.
W78-11613

UPTAKE AND METABOLISM OF DIMETHYLAMINE SALT OF 2,4-D BY FISH,
Syracuse Research Corp., New York.
H. C. Sikka.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 195-200, 4 tab, 6 ref.

Descriptors: *2,4-D, *Herbicides, *Bioaccumulation, *Fish, *Absorption, *Metabolism, *Aquatic Plant Control Program, Aquatic weed control, Pesticide residues, Chemcontrol, Sunfishes, Channel catfish, Carbon radioisotopes, Radioisotopes, Tracers, Eutrophication, Water pollution effects.

Tests of the ability of fish to metabolize the herbicide 2,4-D under conditions of minimal microbial degradation showed very low uptake by bluegills and channel catfish and no bioaccumulation by either fish. Carbon-14 uniformly ring-labelled 2,4-dichlorophenoxacetic acid dimethylamine salt (DMA-2,4-D) and nonradioactive DMA-2,4-D were used in the experiments. Residues of 2,4-D detected in the fish were below this chemical's established tolerance limit of 1.0 ppm. Low DMA-2,4-D uptake may be due to the herbicide being mostly present in the water in an ionized form which is less likely to chemically partition from water into fish. The findings demonstrate that the fish were unable to metabolize 2,4-D. The fish removed less than 0.5% of the carbon-14-labelled DMA-2,4-D when exposed in aquaria to water containing two ppm of the herbicide. Maximum herbicide concentration in the fish was reached within 24 hrs of treatment, and did not change significantly thereafter for seven days. Catfish removed a smaller amount than did bluegills. Fish specimens were separated into two portions for analysis: head plus viscera, and edible flesh. Most of the radioactivity absorbed was found in the head plus viscera portions and relatively low concentrations in the edible flesh. The fish did not metabolize 2,4-D during the seven days following treatment. Bluegills administered carbon-14-labelled DMA-2,4-D by intraperitoneal injection excreted 90% within six hrs of treatment. (See also W78-11591) (Lynch-Wisconsin)
W78-11614

CHARACTERIZATION AND EVALUATION OF POLYMERS CONTAINING HERBICIDES AS PENDENT SIDE CHAINS,
Wright State Univ., Dayton, OH. Dept. of Chemistry.
F. W. Harris.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 201-216, 10 fig, 3 tab, 7 ref.

Descriptors: *Herbicides, *Controlled-release herbicides, *Polymers, *Hydrolysis, *2,4-D, *Silvex, *Aquatic Plant Control Program, Aquatic weed control, Chemcontrol, Rates of application, Pendent side chains, Fenac, Monomers, Homopolymers, Copolymers, Hydrogen ion concentration, Eutrophication, Water pollution effects.

One way to reduce excessive amounts of inert polymer carrier (70-90% w/w) in controlled-release herbicides is synthesis of polymers containing herbicides as pendent side chains. Major objectives of the present research were to: (1) complete a study of hydrolysis of polymers containing 2,4-D; (2) determine effects of pH on the polymers' rates of hydrolysis; (3) synthesize and polymerize a new series of vinyl monomers containing 2,3,6-trichlorophenylacetic acid (fenac); and (4) determine rates of hydrolysis of the polymers containing fenac under carefully controlled conditions. Results: (1) Vinyl monomers containing fenac can be polymerized by free-radical techniques, but viscosities of the polymers are not as high for those prepared from vinyl monomers containing 2,4-D. (2) Homopolymers containing 2,4-D or fenac as pendent substituents will not undergo hydrolysis in water with a pH of seven or eight at 30C; increasing the length of the pendent side chains does not result in hydrolysis. (3) Copolymers containing 2,4-D or fenac and hydrophilic residues will slowly hydrolyze in water at 30C; increasing pH from seven to eight does not significantly enhance the hydrolysis rate; carboxylic acid groups are the most effective intramolecular catalyst for hydrolysis. Future research should be directed at copolymers containing herbicides and hydrophilic residues, which appear to have considerable potential as controlled-release agents. (See also W78-11591) (Lynch-Wisconsin)
W78-11615

DEVELOPMENT AND EVALUATION OF CONTROLLED RELEASE HERBICIDES,
Creative Biology Lab., Inc., Barberton, OH.
For primary bibliographic entry see Field 5G.
W78-11616

EFFICACY EVALUATION OF CONTROLLED-RELEASE HERBICIDES,
University of Southwestern Louisiana, Lafayette. Dept. of Plant Industry.
For primary bibliographic entry see Field 5G.
W78-11617

PROGRESS IN THE USE OF PLANT PARTHOGENS AS BIOLOGICAL CONTROLS FOR AQUATIC WEEDS,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5G.
W78-11618

TOTAL PHOSPHORUS MODEL FOR THE GREAT LAKES, (DISCUSSION),
Cleveland State Univ., OH.
S. R. Goswami.
American Society of Civil Engineers, Journal of the Environmental Engineering Division, Vol. 104, No. 2, p 376-377, April 1978. 4 ref.

Descriptors: *Model studies, *Phosphorus, *Great Lakes, *Eutrophication, *Mathematical models, Nutrients, Limiting factors, Lakes, Seasonal, Sediments, Interstices, Algae, Phytoplankton, Settling velocity.

A critique discusses eutrophication-related oversimplifications and omissions of a proposed model of phosphorus inputs into the Great Lakes (Chapra, 1977), (See W78-03643). The model ignores seasonal variability, such as the late spring or summer peak of eutrophic conditions, when all principal parameters are catalyzed by temperature-regulating stratification. In the budget model a positive term should be included on the right-hand side of equation relating resolubilization of phosphorus to its release to the water. In attributing a sizeable fraction of incoming phosphorus to lacustrine sediments, no provision appears to have been made for phosphorus incorporation into the algal mass, unless 'S' accounts for both benthic microbial flora and fauna and the floating algal mat. The sediment surface area is assumed to be the same as the lake's surface area, which is unlikely, and the presence of interstitial water which may account for a substantial fraction of A sub s is ignored. Since input from the lakes includes many nonpoint sources, and the lakes generally do not have a uniform depth, it probably cannot be assumed that settling velocities are always independent of depth; it is not likely that the relationship between the discharge rate terms (v and A sub s) is linear. Reduction factors or coefficients should be included in equation 10 to account for the retentivity of phosphorus in overland runoff. (Lynch-Wisconsin)
W78-11623

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN, I. INTRODUCTION - THE STUDY AND THE STUDY AREA,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
D. J. Tranter.
Australian Journal of Marine and Freshwater Research, Vol. 28, No. 5, p 529-539, 1977. 7 fig, 65 ref.

Descriptors: *Indian Ocean, *Zooplankton, *Copepods, *Euphausiids, *Pteropods, *Ecosystems, *Oceanography, Oceans, Seasonal, Biomass, Hydrology, Abundance, Species composition, Biocenoses, Distribution, Currents(Water), South Equatorial Current, Nutrients, Primary productivity, Chlorophyll, Latitudinal studies, Eutrophication.

This paper introduces a series of final reports on a 1962-1963 seasonal survey of hydrology and zooplankton in the eastern Indian Ocean and

presents some important results. Besides hydrology, reports deal with zooplankton biomass, numbers, and seasonal distribution, and species of copepods, euphausiids, amphipods, and pteropods. Samples were collected at 18 stations on the 110 degree E. meridian between 9 degrees 30' and 32 degrees S. latitude. Evidence indicates that plankton biocenoses are related to Sverdrup's water masses. The South Indian Ocean Gyre acts as a basin where nutrient-depleted surface waters enter and sink; the floor of the basin, which is the permanent deep oceanic thermocline, impedes nutrient enrichment from below. Dynamic uplift on the right-hand flank of the South Equatorial Current, the major circulation feature of the study area, leads to nutrient enrichment of the euphotic zone and increased plankton production. This 'Java dome' is the major anomalous physical feature in the eastern Indian Ocean. A northern tropical zone and southern subtropical zone are recognized as subsystems within the study area. Tropical plankton and micronekton biomass exceeds subtropical biomass, with maxima in May-October. Zooplankton in the tropical zone are in phase with nutrients and productivity, but not well correlated with chlorophyll-a; zooplankton in the subtropical zone were out of phase with chlorophyll-a, which was here well-correlated with productivity. (See W78-11625 thru W78-11627) (Lynch-Wisconsin)
W78-11624

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN III. NUMERICAL ABUNDANCE AND BIOMASS,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
D. J. Tranter, and J. D. Kerr.
Australian Journal of Marine and Freshwater Research, Vol. 28, No. 5, p 557-583, 1977. 21 fig, 2 tab, 27 ref.

Descriptors: *Indian Ocean, *Zooplankton, *Abundance, *Biomass, *Distribution, *Eutrophication, *Oceanography, Nutrients, Oceans, Latitudinal studies, Ecosystems, Regression analysis, Seasonal, Diurnal, Larvae, Fish eggs, Decapods, Amphipods, Coelenterata, Copepods, Tropical regions, Subtropic, Algae.

Zooplankton samples collected August 1962-August 1963 along the 110 degree E. meridian in the eastern Indian Ocean were analyzed for abundance and biomass in relation to distribution-controlling factors. Regression analysis showed that season, latitude, and time of day were often significant causes of variance. Several organisms were more abundant by night than by day: Decapoda, Amphipoda, fish eggs, fish larvae, Coelenterata, and sometimes Copepoda. Numbers were generally high in late winter (June-September) and low in early summer, with a secondary peak in early autumn (March). Numbers were generally high at low latitudes (9-15 degrees S.) and low at high latitudes (25-32 degrees S.), except fish eggs and larvae, whose center of abundance was 24-25 degrees S. Seasonal periodicity was frequently in phase along the study section, numerical abundance reaching a peak one to two months after a general phytoplankton bloom at the onset of the southeast monsoon. Mass transport of upper waters during the south monsoon season suggests that the subtropical-tropical synchrony (despite no subtropical source of nutrient enrichment comparable to the Java dome), considerable enrichment at both the Java dome and northwest Australian shelf between May and August, and whale distribution patterns constitute a trophic sequence. The second zooplankton peak (in March) results from a summer algal bloom generated possibly by remineralization of organic matter from the previous southeast monsoon season. (See also W78-11624) (Lynch-Wisconsin)
W78-11625

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN V. ECOLOGY OF THE COPEPODA,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
D. J. Tranter.
Australian Journal of Marine and Freshwater Research, Vol. 28, No. 5, p 593-625, 1977. 15 fig, 12 tab, 76 ref.

Descriptors: *Copepods, *Indian Ocean, *Zooplankton, *Distribution patterns, *Ecosystems, *Ecology, *Computer programs, *Oceanography, *Species composition, Oceans, Temporal distribution, Spatial distribution, Faunal lists, Species diversity, Seasonal, Bioindicators, DIVINF, MULTCLAS, GROUPER, Biocenoses, Geocenoses, Tropical regions, Subtropic.

Spatial and temporal distribution patterns of 70 copepod species from the eastern Indian Ocean along the 110 degree E. meridan are described, based on a 1962-63 survey. Data are evaluated for use in site and species classifications, and the classification DIVINF and MULTCLAS were used to identify major habitat complexes and relate them to Rochford's water masses. The program GROUPER and inverse DIVINF analyses were then used to identify niche and habitat complexes (biocenoses and geocenoses). The diversity regime was described with numerical data. The greatest proportion of endemic species occurred south of Java, including such neritic species as Acartia erythraea and Eucalanus dentatus, upwelling species as Calanoides carinatus, and other species, including Eucalanus crassus, Euchaeta concinna, and Candacia catula. The best bioindicator of tropical water was Candacia pachydactyla, and of mixtures of tropical and subtropical water was Euchaeta wolfendeni. Diurnally and seasonally separate biocenoses were found, characterized in particular by the genus Pleuromamma. The agglomerative program MULTCLAS, using quantitative and qualitative data, defined plankton geocenoses more clearly than the simple divisive program DIVINF using qualitative (presence-absence) data alone. Six geocenoses were identified, two tropical, two subtropical, and two mixed. A diversity maximum was located at 20 degrees S. in the tropical convergence, using the Shannon-Wiener entropy function H. (See also W78-11624) (Lynch-Wisconsin)
W78-11626

FURTHER STUDIES OF PLANKTON ECOSYSTEMS IN THE EASTERN INDIAN OCEAN VII. ECOLOGY OF THE AMPHIPODA,
Australian Museum, Sydney.
H. A. Tranter.
Australian Journal of Marine and Freshwater Research, Vol. 28, No. 5, p 645-642, 1977. 6 fig, 3 tab, 33 ref.

Descriptors: *Indian Ocean, *Ecology, *Amphipods, *Zooplankton, *Distribution, *Species composition, *Classification, *Oceanography, Abundance, DIVINF, MULTCLAS, Ecosystems, Salinity, Water temperature, Subtropic, Tropical regions, Seasonal, Faunal lists, Vertical migration.

Hyperiid amphipods were sampled along the 110 degree E. meridan in the eastern Indian Ocean August 1962-August 1963; 64 species taken in 215 samples were identified and counted, and their distribution analyzed. Divisive and agglomerative numerical analyses were conducted to determine sampling site groups, species groups, and interrelationships. One species group (Phronimella elongate, Anchylomera blossevillei, and Hyperietta stephenseni) correlated with low-temperature, high salinity subtropical waters; three other groups correlated with the higher-temperature, low-salinity tropical waters (Vibilia armata, Eupronoe armata, E. minuta; Platyscelus serratulus, Paratyphis maculatus; and Paraphronima gracilis, Eupronoe laticarpa, Amphithyrus bispinosus). Ten species were present at over 40% of the stations, and another 28 species (48%) were present at over 10% of the stations. Mean species per station was 10. All species are listed with data on occurrence, and are discussed by family. The computer program DIVINF was used to classify the 215 sampling sites according the presence or absence of the 34 most widespread species, and the program MULTCLAS was used to classify the 99 night sampling sites with reference to the 32 most ubiquitous species at those sites. Diurnal vertical migration was indicated by the data. (See also W78-11624) (Lynch-Wisconsin)
W78-11627

HYDROCARBONS OF OYSTERS AND SHORT-NECKED CLAMS IN HIROSHIMA BAY,
Hiroshima Univ. (Japan). Faculty of Integrated Arts and Sciences.
S. Yasuda, and N. Fukamiya.
Bulletin of the Japanese Society of Scientific Fisheries, vol. 44, no. 5, p521-524, 1978. 2 fig, 2 tab, 12 ref.

Descriptors: *Oil pollution, *Oil, *Oysters, *Clams, Organic compounds, Gas chromatography, Laboratory tests, Path of pollutants, Chemical analysis, Water analysis, Biodegradation, Chemical resdues, *Alkanes, *Tissue analysis, Bioaccumulation, Tapes, *Biotransformation.

The n-alkane distributions of oysters and short-necked clams collected from Hiroshima Bay were examined. An absence of any biogenic odd-carbon predominance of n-alkanes was found. After 30 days of starvation of the clams in artificial sea water, considerable amounts of hydrocarbons were found to be retained, but the n-alkane distribution showed a preferential disappearance of shorter chain odd-carbon n-alkanes. Furthermore, the fecal hydrocarbons of the clams showed an even-carbon, predominance of the n-alkanes. Although petroleum oil was not detected by taste or smell, the values of carbon preference index and n-C 16 ratio indicated some low-level oil pollution of the bivalves. Moreover, the presence of non-biogenic alkylated benzenes also indicated that some oil pollution of the oysters had occurred. (EIS-Deal)
W78-11635

TRANSFER OF COBALT-60 FROM PHYTOPLANKTON TO THE CLAM (MERCENARIA MERCENARIA),
National Inst. of Radiological Sciences, Nakaminato (Japan). Marine Radio-Ecological Research Station.
M. Nakahara, and F. A. Cross.
Bulletin of the Japanese Society of Scientific Fisheries, vol. 44, no. 5, p419-425, 1978. 3 fig, 4 tab, 7 ref.

Descriptors: *Clams, *Phytoplankton, *Cobalt, Primary productivity, Secondary productivity, Radioisotopes, Food chains, *Cytological studies, *Diatoms, Radioactive wastes, Water pollution sources, Path of pollutants, Nuclear wastes, Nuclear powerplants, *Tissue analysis.

The transfer of cobalt-60 from phytoplankton (primary producer) to clams (primary consumer) was investigated to obtain additional information about the movement of cobalt-60 in the marine ecosystem. The retention of cobalt-60 in the clams after feeding radioactive phytoplankton varied with size of the clams and cell density and species of phytoplankton fed to the clams. At high cell densities, the retention of cobalt-60 by the clams was reduced with increasing cell density and size of the clams. More than 43% of the radioactivity which was introduced into the pallial cavity of the clams with the diatom (Nitzschia closterium) at cell densities less than 5 x 10 to the seventh power cells/l was retained in the clams two days after feeding. (EIS-Deal)
W78-11636

A THREE-YEAR STUDY AT WINSOR COVE: SALT MARSH GRASSES AND NO. 2 FUEL OIL,
Woods Hole Oceanographic Institution, MA. Dept. of Biology.
G. R. Hampson, and E. T. Moul.
Oceanus, Vol. 20(4), 1977, p 25-30, 4 fig, 8 ref.

Descriptors: Oil, *Oil spills, *Salt marshes, Water pollution effects, Sediments, Massachusetts, *Peat marsh plants, Toxicity, Path of pollutants, Methodology, Erosion, Erosion rates, Winsor Cove, Buzzards Bay, *No. 2 fuel oil, Salt marsh grasses, Salt marsh degeneration, Saliconnia.

The marsh grass community in a small cove in Massachusetts that was affected by spilled oil from a barge in October of 1974 has shown a progressive resistance to reestablish itself over the last three years. The sediments in some areas around the marsh grass roots contain hydrocarbons, which have impregnated the peat substrate. Erosion rates over the three-year period have been 24 times greater than those at a nearby control site. (EIS-Katz)
W78-11637

THE WEST FALMOUTH SPILL - FLORIDA, 1969,
Woods Hole Oceanographic Institution, MA. Dept. of Biology.
H. L. Sanders.
Oceanus, Vol. 20(4), 1977, p 15-24, 3 fig, 2 tab, 10 ref.

Descriptors: Oil, *Oil spills, toxicity, *Mortality, *Fish kills, *Massachusetts, Marine flora, Marine fauna, Benthos, Water pollution effects, Sediments, Mussels, Molluscs, Path of pollutants, Decomposition, Degradation, Gas chromatography, Florida, *No. 2 fuel oil, West Falmouth Harbor, Oil contamination, Hydrocarbons, Buzzard Bay sediments, Polychaetes, Capitella, *West Falmouth, Oil spill.

The author describes the biological effects of the oil spill resulting from the wreck of the Tanker Florida which occurred off West Falmouth, Massachusetts. The immediate biological effects of the spill as well as the long range effects are briefly described. (EIS-Katz)
W78-11638

FATE AND EFFECTS OF OIL IN MARINE ANIMALS,
Woods Hole Oceanographic Institution, MA. Dept. of Biology.
J. J. Stegeman.
Oceanus, Vol. 20(4), 1977, p 59-66, 3 tab, 4 fig, 8 ref.

Descriptors: Marine animals, *Marine fish, Mollusks, Crustaceans, Oysters, Bottom fish, *Lobsters, Animal physiology, *Animal behavior, Biochemistry, Oil, *Oil spills, Water pollution effects, Toxicity, Mortality, Reviews, Marine bacteria.

Summarizes are presented of some of the current theories regrading the fate and effects of oils, both of natural origin and that resulting from spills in aquatic organisms. The mechanisms of hydrocarbon accumulation as well as animals ability to dispose of these compounds are considered. The disappearance of acculumated hydrocarbons begins immediately upon the transfer of fish, crustaceans and molluscs from contaminated to uncontaminated water. (EIS-Katz)
W78-11639

A GENETIC LOOK AT FISH EGGS AND OIL,
National Marine Fisheries Service, Milford, CT. Milford Lab.
A. C. Longwell.
Oceanus, Vol 20(4), 1977, p 46-58, 2 tab, 11 fig, 7 ref.

Descriptors: Oil, *Oil spills, *Massachusetts, Water pollution effects, Marine fish, Commercial fish, Commercial fisheries, *Toxicity, Mortality, Fish eggs, Juvenile fish, Fish physiology, Fish populations, Pathology, Fish behavior, *Genetics, *Argo Merchant Oil Spill, Cod eggs.

The buoyant fish eggs sampled in the vicinity of Argo Merchant oil spill were observed. Oil droplets were seen of 94% of the cod eggs. Cytological and cytogentic assays of mortality and morbidity of cod and pollock eggs from the vicinity of the Argo Merchant oil spill were made. Speculation in the genetic effects of major oil spills on fish populations were made. (EIS-Katz)
W78-11640

A RAPID METHOD OF DETERMINING MAXIMUM PERMISSIBLE CONCENTRATIONS OF TOXICANTS IN LAKE AND STREAM FISHERIES,
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 5A.
W78-11642

SEASONAL DYNAMICS OF THE HEMATOLOGICAL PARAMETERS IN SOME BLACK SEA FISHES AND CHANGES THEREIN AFTER EXPERIMENTAL POISONING WITH PETROLEUM PRODUCTS,
All-Union Inst. of Marine Fisheries and Oceanography, Batumi (USSR), Georgian Div.
A. M. Kotov.
Hydrobiological Journal, Vol 12(4), 1976, p 47-52, 2 tab, 2 fig, 14 ref. (translated from Russian).

Descriptors: Oil, *Oil spills, *Water pollution effects, Path of pollutants, Marine fish, Fish physiology, Fish behavior, Biochemistry, Seasonal, Toxicity, Mortality, *Bioassay, Laboratory test, *Fish pathology, *Hematological parameters, Fish blood, *Dissolved petroleum products, Red blood cells, White blood cells.

Seasonal changes in the hematological parameters (hemoglobin concentration, number of erythrocytes and leukocytes, leukocyte formula and color index) in three Black Sea fish species, as well as the effect (on these parameters) of dissolved petroleum products at concentrations causing acute, subacute and chronic poisoning were investigated. Pathological disturbances of different degrees of intensity, oligochromemia, decrease in the number of erythrocytes and leukocytes, monocytopenia, eosinophilia, lymphocytosis, and neutrophilic leukocytosis were detected. (EIS-Katz)
W78-11643

THE COMMON MUSSEL MYTILUS EDULIS AS AN INDICATOR OF POLLUTION BY ZINC, CADMIUM, LEAD AND COPPER. I. EFFECTS OF ENVIRONMENTAL VARIABLES ON UPTAKE OF METALS,
Melbourne Univ., Parkville (Australia). Dept. of Zoology.
D. J. H. Phillips.
Marine Biology, Vol 38, p. 56-69, 1976. 5 tab, 30 ref.

Descriptors: Metals, *Mussels, *Zinc, *Cadmium, *Lead, *Copper, Water pollution effects, Environmental effects, Seasonal, Salinity, Path of pollutants, On-site investigations, Animal physiology, *Monitoring, Water temperature.

The net uptake of zinc, cadmium, lead and copper by the common mussel, Mytilus edulis L. exposed to different conditions was investigated with a view to using this species as an indicator of contamination of the marine environment by these metals. Seasonal variation in concentrations of zinc, cadmium and copper was found in samples collected at three separate locations. The relationship of seasonal variation to tissue weight and absorption route of the metals is discussed. Near to freshwater inputs of trace metals, the concentrations of zinc, cadmium and lead in mussels were found to vary according to the depth at which the mussels collected; in summer when freshwater run-off is less, this effect was absent. Low salinities did not affect the net uptake of zinc of lead. Low temperatures had no effect on the net uptake of zinc or lead; the net uptake of cadmium was unaffected by low temperatures at high salinities but was decreased by low temperatures at low salinities. The presence of the other metals had no effect on the individual net uptake of either zinc, cadmium or lead. A sampling program was devised to eliminate the effects of these environmental variables and to allow the use of M. edulis as an indicator of zinc, cadmium and lead in marine and estuarine environments. (EIS-Katz)
W78-11644

INFLUENCES OF TEMPERATURE AND SALINITY ON OXYGEN CONSUMPTION OF TISSUES IN THE AMERICAN OYSTER (CRASSOSTREA VIRGINICA),
Maryland Univ. Eastern Shore, Princess Anne. Dept. of Biology.
E. L. Bass.
Comparative Biochemistry and Physiology, Vol 58, No 2B, 1977, p. 125-130, 12 tab, 6 fig, 35 ref.

Descriptors: *Oysters, Animal physiology, Molluscs, Biochemistry, *Water temperature, Salinity, Laboratory tests, *Bioassays, Laboratory animals, Laboratory equipment, Methodology, Sea water, Oxygen, *Dissolved oxygen, *Oxygen consumption, Acclimation, Gill tissues, Mantle tissues.

Oxygen consumption of three oyster tissues was used to assess responses to alterations in temperature and salinity. Cold-acclimated gill tissue showed good acclimatory ability, while mantle tissue showed little and muscle none. Among warm-acclimated tissues gill and mantle showed partial acclimation and muscle none. Upon dilution of the sea water medium gill and mantle tissues showed increased oxygen consumption, while muscle tissue showed no alteration. No significant alterations in tissue oxygen consumption took place in response to increased salinity of the medium. (EIS-Katz)
W78-11645

AN ASSESSMENT OF THE POTENTIAL CARCINOGENIC HAZARD OF PETROLEUM HYDROCARBONS IN THE MARINE ENVIRONMENT,
University of Manchester Inst. of Science and Technology (England).
P. J. King.
Rapports et Proces-Verbaux des Reunions, Conseil International Pour L'Exploration de la Mer, Vol 171, p 202-211, 1977. 4 tab, 54 ref.

Descriptors: *Organic compounds, *Water pollution effects, *Oil, *Toxins, *Toxicity, Pathology, Aromatic compounds, Path of pollutants, Public health, Reviews, Pollutants, Food chains, Commercial shellfish, Commercial fish, *Carcinogenic effects, *Polycyclic aromatic hydrocarbons.

Crude petroleums are known to contain low concentrations of a number of substances mainly of the polycyclic aromatic hydrocarbons type, which can, on prolonged intimate contact, cause skin cancer in man. Similar substances are present in the environment as byproducts of pyrolysis etc. and as natural constituents of certain vegetable foodstuffs. These substances have only a very limited solubility in water and at such low concentrations should cause little hazard, but there is a possibility of their concentration in the food chain. This paper attempts to examine all aspects of this problem in the light of published research in a variety of disciplines. (EIS-Katz)
W78-11646

EFFECT OF EFFLUENT FROM FISH PROCESSING PLANTS ON AQUATIC ORGANISMS,
Kaspiiskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Astrakhan (USSR).
E. I. Beschetnova, and G. V. Zemkov.
Hydrobiological Journal, Vol 12(2): 1976, p. 54-57 3 tab, 10 ref. (Russian translation).

Descriptors: *Bioassay, *Mortality, Toxicity, Dissolved oxygen, Daphnia, Freshwater fish, Fish eggs, *Food processing industry, Water pollution, Water pollution effects, Oxygen demand, Fish physiology, Fish behavior, Pathology, Astrakhan fish packing and refregeration plant, Fish packing.

Bioassays were conducted with fish and Daphnia to determine the acute toxicity and chronic toxicity of the effluent from the Astrakhan Fish Packing and Refregeration plant. The acute toxicity experiments showed that the effluent caused an oxygen deficiency in the water. The suspended matter covered fish eggs, thus suffocating them. Long-term experiments with effluent up to 10.0 ml/liter showed no ill effects and no pathological signs were observed. (EIS-Katz)
W78-11647

THE CHEDABUCTO BAY SPILL - ARROW, 1970,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 5B.
W78-11648

FECUNDITY OF BLUEGILL AND WARMOUTH FROM A SOUTH CAROLINA BLACKWATER LAKE,
Carolinas Virginia Nuclear Power Associates, Inc., new Hill, NC. Energy and Environmental Center.
F. M. Panek, and C. R. Cofield.
The Progressive Fish Culturist, Vol 40(2), 1978, p 67-68. 2 fig, 7 ref.

Descriptors: Freshwater fish, *Lakes, *Primary productivity, Sunfish, Bass, *Reproduction, Fish eggs, South Carolina, Growth, Fecundity, Hydrogen ion concentration, *Acidic water, *Blackwater lakes, Sunfish, Warmouth bass, Lepomis, Lake Robinson, South Carolina.

The relations of fecundity to total length (mm) were developed for the bluegill (Lepomis macrochirus) and warmouth (L. gulosus) from a large southeastern blackwater lake. Fecundity estimates for bluegills ranged from 571 to 27,027 eggs per female and were related to total length by the expression log 10 F=2.337 + 2.839 log 10 TL (mm) with r2 = 0.59 (where F= fecundity and TL= total length). Bluegill fecundity was lower and diameters of mature eggs were smaller than those reported in the literature. Fecundity estimates for warmouths ranged from 798 to 34,257 eggs per female and could be expressed by the relation log 10 F=4.678 + 3.889 log 10 TL(mm) with r2=0.67. Fecundity of warmouths as determined from this relation is similar to that for fish in other habitats. (EIS-Katz)
W78-11649

RESPONSES OF HETEROTROPHIC BACTERIAL POPULATIONS TO PH CHANGES IN COAL ASH EFFLUENT,
Texas Univ. Health Science Center at Houston. School of Public Health.
R. K. Guthrie, D. S. Cherry, and F. L. Singleton.
Water Resources Bulletin, Vol 14, No 4, p 803-808, August 1978. 1 fig, 2 tab, 14 ref.

Descriptors: *Hydrogen ion concentration, *Water pollution effects, *Aquatic bacteria, *Bioindicators, *Fly ash, Water pollution sources, Aquatic microorganisms, Biological communities, Pseudomonas, Industrial wastes, Water temperature, Environmental effects, Acidity, Acidic water, Bacillus, Flavobacterium, Sarcina, Achromobacter, Chromobacterium, Brevibacterium, *Coal ash effluents.

Total culturable heterotrophic bacteria in a coal ash basin and drainage system were monitored over a period of two years. In the first year heavy (bottom) ash was sluiced to the basin resulting in a pH of 6.5. During the second year fly ash was precipitated and added to the sluice lowering the basin pH to 4.6. Sulfate concentration during 1975 ranged from 16-73 ppm (mean 33) and in 1976 from 44-88 ppm (mean 72). Mean annual basin temperatures were 28.8 and 26.0C, respectively. Approximately 1500 m in the receiving swamp below the basin, mean pH and temperature were 6.8 and 22.2C for the first year, and 5.4 and 22.1C for the second. Total culturable bacteria and diversity (colony types) were reduced at all sampling stations by 44 and 30 percent, respectively, whereas the percentage of the population comprised of chromagenic bacteria increased by 51 percent at the lower pH. Data indicated the pH had a greater effect than did water temperature when temperature was within the range of 15-25C. The predominant genera within the system in the first year were Bacillus, Sarcina, Achromobacter, Flavobacterium, and Pseudomonas. In the second year, at the lower pH, predominant genera were Pseudomonas, Flavobacterium, Chromobacterium, Bacillus, and Brevibacterium. (EIS-Katz)
W78-11651

ESTIMATED ZOOPLANKTON PRODUCTION AND THEIR AMMONIA EXCRETION IN THE KUROSHIO AND ADJACENT SEAS,
Australian Inst. of Marine Science, Townsville.
T. Ikeda, and S. Motoda.
Fishery Bulletin, Vol 76, No 2, p 357-368, 1978. 3 fig, 5 tab, 60 ref.

Descriptors: *Ammonia, *Zooplankton, *Food chains, *Biological communities, *Secondary productivity, *Distribution, Productivity, Nutrients, Trophic levels, Nitrogen compounds, Biomass, Water temperature, Respiration, Cycling nutrients, Invertebrates, Seasonal, Aquatic microorganisms, Size, *Kuroshio Sea(Japan).

Production and ammonia excretion of zooplankton in the Kuroshio and adjacent seas were estimated from field data of biomass, size distribution, and habitat temperature of zooplankton, and from experimental data of respiration and ammonia excretion rates as functions of body size and temperatures. Winberg's basic balanced equations were applied to calculate production from respiration data. Further, mortality related to the lifespan and the ratio of herbivores to carnivores in the zooplankton community were estimated from theoretical assumptions. In this study, 18-72% of primary production was grazed by herbivorous zooplankton, and production of herbivorous zooplankton, was 10-60 mg C/square meter per day. The ecological efficiency between primary and secondary production was 5-22%. Ammonia-nitrogen excreted by zooplankton was 4-24 mg N/square meter per day, which can support 11-44% of the nitrogen requirements of primary production. (EIS-Katz)
W78-11652

STUDIES ON THE RELATIVE TOXICITY OF FEW SYNTHETIC DETERGENTS TO A FISH MACRONES VITTATUS,
D.A.V. Coll., Muzaffarnagar (India). Dept. of Zoology.
S. R. Verma, D. Mohan, and R. C. Dalela.
Acta Hydrochimica et Hydrobiologica, Vol 6(2), 1978. p. 121-128. 4 tab, 1 fig, 16 ref.

Descriptors: *Detergents, *Surfactants, Bioassay, Toxicity, *Water pollution effects, Mortality, Laboratory tests, Freshwater fish, Domestic wastes, Fish behavior, Phosphates, Freshwater fish.

In the present investigation, static bioassay studies have been made with few synthetic detergents so as to determine to 50 per cent lethal concentration (LC50) and harmless concentrations. The LC50 values of these detergents ranged from 0.28 to 1.73 mg/l (from 6 to 96 hours). The Swascofix E45 is the most highly toxic and Swascol 4 L the least toxic detergent and the other lies between them. The safe concentrations for different detergents have been worked out. On the basis of these data it is suggested that a lot of treatment of dilution is necessary for the safe disposal of these detergent wastes. (EIS-Katz)
W78-11653

ACUTE RESIDUAL TOXICITY OF SEVERAL WASTEWATER DISINFECTANTS TO AQUATIC LIFE,
Grand Valley State Colleges, Allendale, MI. Dept. of Biology.
R. W. Ward, and G. M. DeGraeve.
Water Resources Bulletin, Vol 14, No 3, p 696-709, 1978. 5 tab, 42 ref.

Descriptors: *Chlorine, *Disinfection, *Bromine, *Ozone, *Waste water treatment, Chorine compounds, Chlorination, Waste water, Toxicity, Daphnia, Sulfur compounds, Salmonids, Carp, Bioassay, Chemical analysis, Water treatment, Water purification, *Sulfur dioxide.

This study was conducted to determine the comparative acute toxicity of chlorine, bromine chloride, and ozone in wastewater, and to determine any acute toxicity associated with chlorinated wastewater which had been dechlorinated with sulfur dioxide. Toxicity tests were conducted with several species of cyprinids, salmonids and centrarchids, and the freshwater macroinvertebrate, Daphnia magna. Chlorinated effluent exhibited the greatest potential for residual toxicity of any disinfected stream tested. The reduced residual toxicity of chlorobrominated or ozonated effluent was largely the result of the more rapid dissipation of these disinfectants in wastewater. The acute residual toxicity of chlorinated effluent was eliminated by dechlorination with sulfur dioxide. (EIS-Deal)
W78-11654

THE FACTORS INFLUENCING THE DISTRIBUTION OF SACCORHIZA POLYSCHIDES IN THE REGION OF LOUGH INE,
Glasgow Univ. (Scotland). Dept. of Botany.
T. A. Norton.
Journal of the Marine Biological Association of the United Kingdom, Vol 58, p 527-536, 1978. 1 fig, 3 tab, 29 ref.

Descriptors: *Environmental effects, *Primary productivity, *Marine plants, *Silts, *Marine algae, Growth rates, Plant diseases, Aquatic plants, Lake sediments, Distribution patterns, Grazing, Biological communities, Laboratory tests, On-site Investigations, *Lough Ine(Ireland), Saccorhiza polyschides, *Sea Urchins.

Saccorhiza polyschides has failed to colonize Lough Ine, a marine inlet in Co. Cork, Ireland, in spite of the abundance of spores swept in continually by the tide. The reasons for this failure were investigated by means of both culture experiments in the laboratory and transplantation experiments in nature. The responses of S. polyschides were contrasted with those of Laminaria saccharina, a closely related species that does grow in the Lough. Of the abiotic environmental conditions which may be correlated with the absence of S. polyschides from the Lough, only excessive siltatin seems to be critical. Silttion cannot wholly explain the exclusion of S. polyschides from Lough Ine for in culture at least, it seems to operate equally effectively against L. saccharina. It seems clear that the combined effects of siltation, preferential grazing by the sea urchin Paracentrotus lividus, and tissue decay, ac-

celerated by the conditions in the Lough, are sufficient to explain the absence of S. polyschides from Lough Ine. (EIS-Katz)
W78-11655

EFFECTS OF INTRINSIC AND ENVIRONMENTAL FACTORS ON OXYGEN CONSUMPTION IN THE BLUE CRAB, CALLINECTES SAPIDUS, RATHBUN,
Virginia Inst. of Marine Science, Gloucester Point.
C. E. Laird, and P. A. Haefner, Jr.
Journal of Experimental Marine Biology and Ecology, Vol 22, p 171-178, 1976. 1 tab, 2 fig, 34 ref.

Descriptors: *Crabs, *Respiration, *Environmental effects, *Animal physiology, *Salinity, *Water temperature, Crustaceans, Invertebrates, Shellfish, Oxygen, Metabolism, Size, Temperature, Laboratory tests, Callinectes, *Blue crab.

The effect of weight, sex, temperature, and salinity on oxygen consumption in intact Callinectes sapidus has been determined. Weight-specific oxygen consumption decreases with increasing wet weight from 20 to 200 g; sex has no effect over this weight range. Oxygen consumption is little affected by experimental salinities from 10 to 30 o/oo. Crabs acclimated to cold (10C) consume more oxygen when acclimated to low salinity (10 o/oo) than when acclimated to high salinity (30 o/oo). Crabs acclimated to low salinity consume more oxygen when cold acclimated than when warm acclimated (24C). Oxygen consumption increases with experimental temperature from 10 to 25C and is higher in cold acclimated crabs than in warm acclimated crabs, except at the intermediate temperature (17.5C), where there is no apparent effect of acclimation temperature. (EIS-Katz)
W78-11656

DER QUEEKSILBERGEHALT IN MUSKELN DES KARPFENCYPRINUS CARPIO L. - ALS INDIKATOR DER WASSERVERUNREINIGUNG (THE MERCURY CONTENT OF CARP (CYPRINUS CAPRIO L.) MUSCLES AS AN INDICATOR OF WATER PURIFICATION,
Institut fuer Meereslebensmittel Technologie, Szezecin (Poland).
For primary bibliographic entry see Field 5A.
W78-11657

ORGANOCHLORINE AND MERCURY RESIDUES IN THE HARP SEAL (PAGOPHILUS GROENLANDICUS),
Guelph Univ. (Ontario). Dept. of Biomedical Sciences.
P. Jones.
The Science of the Total Environmental, Vol 5, 1976. p. 181-199, 8 tab, 37 ref.

Descriptors: *Polychlorinated biphenyls, *DDT, Insecticides, Polychlorinated hydrocarbon insecticides, *Mercury, metals, *Path of pollutants, Water pollution effects, *Animal pathology, Public health, Juvenile growth stage, Dieldrin, *Harp seals, Pagophilus groenlandicus, *methyl mercury, Tissue concentrations, *Seal pups, Mercury residues.

Samples of blubber, liver, kidney and brain, obtained from 10 male, 6 female neonatal, and 4 lactating female harp seals (Pagophilus groenlandicus) were analyzed for DDT, dieldrin, PCB, and total mercury. Methyl mercury levels in blood were also determined. Biocide deposition was not significantly different in female and male ten day old pups. There was no significant difference in biocide levels in the liver of the 14/+ day old males, but in blubber there were significant differences in dieldrin and DDT. There was no clear relationship between biocide levels in the 6-18 year old lactating adults and their pups. Younger adult seals (6 and 7 years) were found to have higher levels of PCB and DDT levels in their blubber than did older females (10 and 18 years). Wide intraspecific variation was noted in organochlorine and mercury residue levels. Pups taken in 1973 were found to have lower organochlorine residues than pups taken in the same area in 1971. Preliminary investigation indicates that detectable amounts of organochlorine and mercury residues are capable of crossing the placenta in the harp seal. (EIS-Katz)
W78-11658

ORGANIC POLLUTION OF BOTTOM MUD IN THE SETO INLAND SEA AND ITS REMOVAL EXPERIMENT,
Nansei Regional Fisheries Research Lab., Hiroshima (Japan).
For primary bibliographic entry see Field 5G.
W78-11659

A FLOW-THROUGH TESTING PROCEDURE WITH DUCKWEED (LEMNA MINOR L.),
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5A.
W78-11660

EFFECT OF HYDROGEN SULFIDE ON THE SURVIVAL RATE OF EGGS AND EMBRYONAL MITOSES OF THE BLACK SEA TURBOT,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
V. N. Ivanov, T. G. Usenko, and A. V. Parkhomenko.
Hydrobiological Journal, Vol. 12(2), 1976, p 60-62, 1 tab, 6 ref. (Translated from Russian).

Descriptors: Bioassay, *Toxicity, Mortality, Fish eggs, *Hydrogen sulfide, Marine fish, Fish genetics, Fish physiology, *Fish reproduction, Laboratory tests, *Oxygen, Embryonic growth stage, *Black Sea, Black Sea turbot, *Egg survival, Embryonal mitoses.

Bioassays with turbot eggs showed that the maximum hydrogen sulfide concentrations at which fish survived was 2.2 to 2.3 mg/l. Sublethal concentrations of hydrogen sulfide in seawater did not have a cytogenic effect. Fish eggs in the toxic levels of hydrogen sulfide died before the mutagenic effect of hypoxin was manifested. (EIS-Katz)
W78-11661

A SURVEY OF THE FISH POPULATIONS OF THE MIDDLE SEVERN ESTUARY BASED ON POWER STATION SAMPLING,
Bath Univ. (England). School of Biological Sciences.
M. W. Hardisty, and R. J. Huggins.
International Journal of Environmental Sciences, Vol. 7, 1975, p 227-242, 1 tab, 15 fig, 23 ref.

Descriptors: *Estuaries, *Nuclear power plant, Marine fish, Seasonal, *Distribution, Animal populations, Methodology, Statistical methods, Bottom fish, Fish populations, *Fish harvest, Fish migration, *Power plant sampling, England, Middle Severn Estuary, Oldbury-on-Severn, Power Station.

Over a period of a year, weekly 24-hour samples have been taken of fish species collected from the screens of the Oldbury-on-Severn Nuclear Power Station in the Middle Severn estuary (U.K.). The faunal list consists of 48 species compared with the 44 species recorded in a 3-year survey (based on the examination of commercial catches) made over 30 years earlier. Numbers of fish as well as variety of species increased through the autumn and winter, reflecting in part a seasonal movement of several gadoid species into the estuary. The Power Station samples contained some species not previously recorded, specifically for the Oldbury region often in considerable numbers. A short description of the biological characteristics and seasonal changes in frequency is given for each of the more important estuarine species. (EIS-Katz)
W78-11662

EFFECT OF HYDRAULIC WORKS ON THE PARASITE FAUNA OF THE DNIEPER RIVER,
Akademiya Nauk URSR, Kiev. Inst. Zoology.
A. P. Markevich, M. P. Iskov, V. P. Koval, and M. I. Chernogorenko.
Hydrobiological Journal, Vol. 12(2), 1976, p 1-6. 27 ref. (Translated from Russian).

Descriptors: Freshwater fish, *Fish diseases, *Parasitism, Commercial fish, *Dams, Reservoirs, *Reservoir fisheries, Zooplankton, Crustaceans, Mollusks, Fisheries, Food chain, Sediments, Worms, Public health, Species diversity, Trematodes.

The construction of dams and reservoirs in the Dnieper River has resulted in changes of the parasitic fauna of resident fishes. One of the main factors responsible for altering the species composition of fish parasites with a complex life cycle was the change in abundance and diversity of the aquatic invertebrates that serve as intermediate hosts. The decrease on the infestation of fishes with trematodes that require mollusk hosts decreased by 60-75% in the lower reservoir. (EIS-Katz)
W78-11663

TOXICOLOGICAL CHARACTERISTICS AND SYMPTOMS OF ACUTE PHENOL POISONING IN SOME FRESHWATER CRUSTACEANS AND MOLLUSKS,
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
V. A. Alekseyev, and B. N. Antipin.
Hydrobiological Journal, Vol. 12(2), 1976, p 27-33, 21 ref, 1 tab. (translated from Russian).

Descriptors: *Phenols, Industrial wastes, Water pollution effects, Animal physiology, *Pathology, *Bioassay, Toxicity, Methodology, Mortality, Molluscs, Crustaceans, Benthos, Zooplankton, Invertebrates, *Daphnia, *Copepoda.

The resistance of freshwater Crustacea to phenol after 48 hours exposure varies (in terms of LC 100) from 20 mg/liter in Polyphemidae to 240 mg/liter in Ostracoda. The resistance of mollusks is mugh higher; from 400 mg/liter in Physidae and Dreissenidae to 1600 mg/liter in Sphaerlidae. The resistance of these organisms depends on a host of factors, the most important being: morphological and physiological (thickness of the integument, presence of a shell, size of the gill surface, mode of feeding, metabolic rate), age-related (various stages of ontogeny), behavioral (mobility, ability to avoid the poisonous environment), ecological (type of water body, reaction to natural pollution), and abiotic (ambient temperature, oxygen concentration). A comparison of the symptoms of poisoning in the animals studied revealed five main phases of the pathological process: increase in general motor activity, loss of coordination due to convulsions, paralysis and parts of the body involved in locomotion, deep paralysis, and death. (EIS-Katz)
W78-11664

LETHAL TEMPERATURES OF AMMOCOETES OF THE SOUTHERN HEMISPHERE LAMPREY, GEOTRIA AUSTRALIS GRAY,
Murdoch Univ., (Western Australia). School of Environmental and Life Sciences.
D. J. Macey, and B. C. Potter.
Environmental Biology of Fish, Vol. 3(2), 1978. p 241-243. 3 fig, 13 ref.

Descriptors: Freshwater fish, *Juvenile forms, Stress, *Water temperature, Thermal water,

Bioassay, Mortality, Methodology, Temperature, Distribution, *Distribution patterns, *Lampreys, *Lethal limit, Western Australia, *Ammocoetes, Resistance time, Geotria australis.

The resistance time of ammocoetes of Geotria australis was related to the time of emergence from the substrate. The incipient lethal temperatures of animals acclimiated at 5, 15, and 25C was 27.3, 27.5 and 28.2C, respectively, the ultimate incipient lethal being 28.3C. This value, which is similar to that of Northern Hemisphere lampreys such as Lampetra planeri, almost certainly accounts for the restriction of this species to the southernmost rivers in Western Australia. (EIS-Katz)
W78-11665

WATER QUALITY AND THE OCCURRENCE OF CHIRONOMUS RIPARIUS MEIGEN (DIPTERA: CHIRONOMIDAE) IN A STREAM RECEIVING SEWAGE EFFLUENT,
Plymouth Polytechnic (England). Dept. of Environmental Sciences.
A. M. Gower, and P. J. Buckland.
Freshwater Biology, Vol. 8, p 153-164, 1978. 8 fig, 2 tab, 38 ref.

Descriptors: *Water quality, *Sewage effluents, *Diptera, Waste water(Pollution), Sewage treatment, Waste water treatment, Outlets, Eutrophication, Larval growth stage, Growth stages, Lotic environment, Nutrients, Oxygen demand, Municipal wastes.

The effects of a sewage effluent in Moat Brook, Staffordshire, England, were determined from regular collections of water and biological samples from directly comparable stations above and below the sewage outfall. The eutrophic conditions below the outfall result in the replacement of Polypedilum laetum by Chrionomus riparius (except in the spring) as the dominant member of the Chironominae. Continuous recruitment of first instar larvae of the population of C. riparius in summer and autumn results in much overlap of generations, but emergence trap captures suggest at least five generations in the year. The usefulness of C. riperius as an indicator of enriched conditions in lotic ecosystems should be considered in relation to oviposition behavior and the occurrence and seasonal variation in density of the adults and aquatic stages (including the more conspicuous third and fourth instar larvae). (EIS-Deal)
W78-11666

SOME FACTORS AFFECTING PHOTOSYNTHESIS AND RESPIRATION MEASUREMENTS IN CLADOPHORA GLOMERATA,
State Univ. of New York Coll. at Fredonia. Dept. of Biology.
K. E. Mantai, and C. Haase.
Journal of Great Lakes Research, Vol. 3, p 191-195, 1977. 3 fig, 1 tab, 12 ref.

Descriptors: *Photosynthesis, *Respiration, *Cladophora, Chemical reactions, Hydrogen ion concentration, Lake Erie, Algae, Cytological studies, Carbon, Phytoplankton, Growth rates, Primary production, Methodology, *Buffers.

Literature values for photosynthesis rates in Cladophora glomerata vary widely. There are several possible reasons for this, including light-limitation in certain types of experiments. Photosynthesis and respiration in Cladophora appear to be strongly pH dependent. Photosynthesis in Cladophora samples from Lake Erie show a pH optimum of about pH 8.2, with rates decreasing to near zero by pH 9.6. Respiration shows a bimodal pH response curve, with optima at about pH 7.6 and pH 9.2. Thus, experiments performed in unbuffered systems can greatly underestimate photosynthesis in Cladophora due to pH changes caused by CO2 uptake. Choice of buffers is an important consideration. Tricine is considered to be biologically unreactive and has a pH of 8.15, making it an ideal buffer for use in slightly alkaline systems. Tris buffer, however, shifts the pH optimum for photosynthesis in Cladophora (measured as oxygen evolution) to about pH 9.0. The response curve for respiration is the same in either buffer. Photosynthesis in Cladophora is depressed in a 100% oxygen atmosphere, suggesting that these cells photorespire. This further complicates estimates of net photosynthesis. (EIS-Deal)
W78-11667

METABOLISM, CRITICAL OXYGEN TENSION, AND HABITAT SELECTION IN DARTERS (ETHEOSTOMA),
Alabama Univ., University. Dept. of Biology.
G. R. Ultsch, H. Boschung, and M. J. Ross.
Ecology, Vol. 59, No. 1, p 99-107, 1978. 3 fig, 4 tab, 32 ref.

Descriptors: *Animal metabolism, *Respiration, *Darters, Oxygen requirements, Habitats, Aquatic habitats, Ecology, Niches, Freshwater fish, Water temperature, Seasonal, Metabolism, Fish physiology, Alabama, *Oxygen tension, Critical oxygen tension, Habitat selection, Metabolic rate, Oxygen consumption.

Six species of darters were studied in the field and laboratory to relate respiration to habitat selection. The species ranged in habitat preference from a fast-water form to a slow-water form. Field measurements showed that winter oxygen tensions were not limiting the distribution of the darters when these tensions were compared with the critical oxygen determination made in the laboratory at a low temperature (10C). However, summertime ambient oxygen levels were as low as 3.3 ppm, a level that was 1.0-1.7 ppm below the wintertime critical oxygen tension (Pc) of several of the species. The fishes compensated for this by lowering Pc in the summer. This finding is contrary to previously reported results on the relationship between Pc and temperature. While not all darters selected habitats such that the downward shift of Pc in summer was of ecological consequence, this was the case in 1 of the slow-water stream forms which inhabits waters in the summer that would be uninhabitable without such a shift in Pc. (EIS-Deal)
W78-11669

LARVA DEFORMITY IN STRIPED BASS, MORONE SAXATILIS (WALBAUM), AND BLUEBACK HERRING, ALOSA AESTIVALIS (MITCHELL), DUE TO HEAT SHOCK TREATMENT OF DEVELOPING EGGS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
T. S. Y. Koo, and M. L. Johnston.
Environmental Pollution, Vol 16, 1978, p 137-149. 3 tab, 3 fig, 15 ref.

Descriptors: *Water temperature, Water pollution effects, Herrings, *Striped bass, Laboratory tests, Laboratory equipment, Fish eggs, Stress, Bioassay, Methodology, Mortality, *Thermal water, *Thermal powerplants, Heated water, *Heat shock, *Larval deformities, Morone, Blueback herring, Alosa aestivalis.

Fertilized eggs of striped bass and blueback herring were subjected to time-temperature exposure typically experienced by entrained organisms in a power plant cooling system. Egg mortality and hatchability were not necessarily good criteria in assessing temperature effects for, even when there was no significant difference in mortality and hatchability between experimental and control lots, adverse effects were manifested in the deformity of larvae hatched. Deformities took the form of shortened body, enlarged finfold, and curved or twisted spine. The severity and incidence of deformity were related to temperature dose, i.e., the product of the elevated temperature and exposure time. No immediate heavier mortality was observed in deformed larvae than in normal larvae, but the lack of normal swimming ability of the deformed larvae suggests their poor eventual survivability. (EIS-Katz)
W78-11671

HEAVY METAL POLLUTION OF THE RIVER IRWELL (LANCASHIRE, UK) DEMONSTRATED BY ANALYSIS OF SUBSTRATE MATERIALS AND MACROINVERTEBRATE TISSUE,
Salford Univ. (England). Dept. of Biology.
J. P. Eyres, and M. Pugh-Thomas.
Environmental Pollution, Vol 16, 1978, p 129-136, 3 tab, 2 fig, 8 ref.

Descriptors: *Metals, *Zinc, *Lead, *Copper, Water pollution effects, Dissolved oxygen, Spectrophotometry, Amphipods, *Sediments, Animal physiology, Biochemistry, Chemical analysis, Hydrogen ion concentration, Oligochaetes, Asellus, Erpobdella, Tissue metal concentrations, River Irwell.

The macroinvertebrate benthos of the River Irwell is impoverished to an extent that cannot be explained solely in terms of organic pollution. Relatively high dissolved oxygen levels are maintained as a result of turbulence. Atomic absorption spectrophotometry reveals substrate-bound levels of lead, copper, and zinc higher than those recorded for an unpolluted river over almost the entire length of the Irwell, and at some sites the contamination is particularly severe. Concentrations in water are very low and it appears that high pH (about 7) leads to rapid precipitation of the discharged metals to substrate materials. The relationships between levels of the metals in substrate materials and in the tissues of Asellus aquaticus L. and Erpobdella octoculata (L.) have been investigated. (EIS-Katz)
W78-11672

DEHP IN THE VICINITY OF AN INDUSTRIAL AREA IN FINLAND,
Helsinki Univ. (Finland). Dept. of Environmental Science.
P.-E. Persson, H. Penttinen, and P. Nuorteva.
Environmental Pollution, Vol 16, 1978, p 163-166, 1 tab, 16 ref.

Descriptors: *Water pollution effects, Path of pollutants, *Freshwater fish, *Phytoplankton, *Zooplankton, Benthos, Biochemistry, Pikes, *Industrial wastes, Sticklebacks, Perch, Soils, DEHP, *Di-(2-ethyl hexyl)phthalate, Roach, Rutilus, Tissue concentrations.

Samples of fish, net plankton, freshwater and soil arthropods and soil obtained in the vicinity of an industrial area were analyzed for di-(2-ethyl hexyl)phthalate (DEHP) content. The highest concentration was found in soil arthropods (2.8 mg/kg). No contamination was discovered in plankton, but the levels of contamination in other organisms were as follows: 0.1 mg/kg in small fish (fry and sticklebacks), freshwater arthropods, molluscs, and perch; 0.5 mg/kg in bream, and 1.1 mg/kg in roach. The muscle and kidney of pike were free from contamination but the contamination of pike's liver was equivalent to 2.3 mg/kg. (EIS-Katz)
W78-11673

METAL CONCENTRATIONS IN SOME SEAWEEDS OF GOA (INDIA),
National Inst. of Oceanography, Panjim (India).
For primary bibliographic entry see Field 5B.
W78-11674

LONG RANGE MOVEMENT AND HOMING BY LARGEMOUTH BASS (MICROPTERUS SAL-

MOIDES) IN A THERMALLY ALTERED RESERVOIR,
Wake Forest Univ., Winston Salem, NC. Dept. of Biology.
T. Quinn, G. W. Esch, T. C. Hazen, and J. W. Gibbons.
Copeia, 1978, No 3, p 542-545. 1 tab, 1 fig, 11 ref.

Descriptors: *Bass, Freshwater fish, *Fish migration, Water pollution effects, *Water temperature, Thermal effects, Fish behavior, Fish physiology, Nuclear energy, *Nuclear powerplants, Nuclear reactors, Nuclear wastes, Thermal pollution, Thermal powerplants, South Carolina, Par pond, Cooling pond.

Par Pond is an 1,120 hectare cooling reservoir for a nuclear production reactor locatee near Aiken, S.C. largemouth bass were caught, tagged and released. The study indicated that movement between thermal and ambient locations occurred but infrequently. Movements were more frequent from ambient to thermal locations. (EIS-Katz)
W78-11675

EFFECTS OF ORGANIC FRACTIONS FROM SECONDARY EFFLUENT ON SELENASTRUM CAPRICORNUTUM (KUTZ),
Rensselaer Polytechnic Inst., Troy, NY.
D. R. Sachdev, and N. L. Clesceri.
Journal Water Pollution Control Federation, Vol 50, 1978, p 1810-1820. 8 tab, 26 ref.

Descriptors: *Algae, *Bioassay, *Nutrients, *Organic compounds, Water pollution effects, Sewage, Sewage effluents, Nitrogen, Phosphorus, Eutrophication, *Organic fractions, Secondary effluents, Algal bioassay, Selenastrum capricornutum, Effluent fractionation, *Growth rate, *Standing crops.

The secondary treated effluents from two domestic wastewater treatment facilities were membrane filtered (0.45 microns), concentrated via freeze-drying technique, and then fractionated. Effect of the concentrated effluents and their various organic fractions on the maximum specific growth rate and maximum standing crop of Selenastrum capriconutum was investigated. In general the concentrated effluents and the organic fractions with apparent molecular weight greater than 700 indicated stimulatory effects on the maximum standing crop. The stimulation of S. capricornutum was the result of the organic compounds in these fractions. The supplemental nitrogen, phosphorus or inorganic carbon added to the medium from the addition of the organic fractions did not contribute to the stimulation of this alga. Neither the concentrated effluents nor any of the organic fraction showed any inhibitory effect on S. capricornumum. (EIS-Katz)
W78-11678

ECOLOGICAL STUDIES ON OLIGOCHAETA INHABITING DEPOSITING SUBSTRATA IN THE IRWELL, A POLLUTED ENGLISH RIVER,
Salford Univ. (England). Dept. of Biology.
J. P. Eyres, N. V. Williams, and M. Pugh-Thomas.
Freshwater Biology, vol. 8, p 25-32, 1978. 3 tab., 5 fig., 18 ref.

Descriptors: *Oligochaetes, *Tubificids, Aquatic animals, *Benthic Fauna, Water pollution effects, *Spatial distribution, *Sampling, *Life cycles, Annelids, Benthos, Invertebrates, Seasonal, Populations, On-Site investigations, Environmental effects, Water quality, Mine wastes, Dissolved oxygen, Tubifex, Limnodrilus, Nais, *River Irwell(England).

Oligochate worms dominate the macroinvertebrate fauna of the River Irwell, in northwest England. The river is polluted by domestic and industrial wastes. Tubificids constituted 86.8% of the worm fauna, with three dominant species, Tubifex tubifex, representing 43.1% of the total oligochaetes, Limnodrilus hoffmeisteri, representing 26.8% and Limnodrilus udekemianus, representing 16.7%. The Naididae were the next most abundant worms, representing 6.1% of the oligochaete fauna, with Nais elinguis comprising 5.0%. T. tubifex and L. hoffmeisteri were abundant along the length of the river, but reached their greatest numbers in the organically polluted lower reaches at Agecroft and Salford. The density of L. udekemianus was low in the Irweli above the entry point of the heavily polluted River Roch, but high below this point. N. elinguis was abundant above the Roch entry point and scarce below it. In the three dominant tubidicids, the main population recruitment occurred during the summer months (April to September for T. tubifex, May to November for L. hoffmeisteri and June to October for L. udekemianus). In N. elinguis, there was massive recruitment in April. (EIS-Katz)
W78-11680

ELEVATED HEAVY METALS: A STRESS ON A POPULATION OF WHITE SUCKERS, CATOSTOMUS COMMERSONI, IN HAMELL LAKE, SASKATCHEWAN,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
G. A. McFarlane, and W. G. Franzin.
Journal of the Fisheries Research Board of Canada, vol. 35, 1978, p963-970. 4 tab., 7 fig., 13 ref.

Descriptors: *Metals, *Zinc, *Copper, *Cadmium, Suckers, Growth, Reproduction, Animal populations, Fish eggs, Fish populations, *Water pollution effects, Path of pollutants, Fish reproduction, Canada, *Stress, *White sucker, *Hamell Lake, Heavy metal fallout, Heavy metal smelters.

This study examined populations of white suckers (Catostomus commersoni), in two physically and chemically similar lakes in the vicinity of, and receiving heavy-metal fallout from, a base-metal smelter complex near Flin Flon, Manitoba. The white suckers occupying Hamell Lake, Saakatchewan, which is contaminated by Zn, Cu, and Cd, showed signs typical of a population under stress when compared with the population in Thompson Lake, Manitoba, which contains much lower levels of these metals. Hamell Lake, white suckers showed greatly increased growth in length and weight, increased fecundity, and earlier age of maturation, but reduced spawning success, reduced larval and egg survival, smaller egg size, and reduced longevity compared with Thompson Lake white suckers. We attraibute these differences to elevated heavy metals in Hamell Lake waters, particularly in early spring, a most critical period in the reproductive cycle of these fish. Effects of the metals on other species of fish in Hamell Lake are also discussed. (EIS-Katz)
W78-11682

EFFECTS OF UPTAKE AND DISCHARGE OF PETROLEUM HYDROCARBONS ON THE RESPIRATION OF THE SOFT-SHELL CLAM, MYA ARENARIA,
Industrial Environmental Research Lab.-Cincinnati, Edison, NJ. Oil and Hazardous Materials Spills Branch.
D. M. Stainken.
Journal of the Fisheries Research Board of Canada, vol. 35, p637-642, 1978. 1 fig., 3 tab., 32 ref.

Descriptors: *Oil, *Clams, *Respiration, *Animal metabolism, *Toxicity, Oil spills, Oil pollution, Organic compounds, Aromatic compounds, Path of pollutants, Water pollution effects, Animal physiology, Fuels, Depuration, Naphthalenes, Mya.

A winter (4 C) spill condition was simulated in which young soft-shell clams were exposed to subacute concentrations of No. 2 fuel oil-in-water emulsions for 28 d. Clams were exposed at the beginning of the experiment to single dose concentrations of 10, 50, and 100 ppm. Hydrocarbons were rapidly accumulated by clams within 1 wk after exposure. The accumulated hydrocarbons then decreased each week as the hydrocarbon content of the water decreased. Methyl substituted naphthalene isomers were the principal compounds accumulated and retained by the clams after 3 wk of oil exposure. A dose-response relationship was observed in the respiratory rates as measured by oxygen consumption. The lowest concentrations of oil caused a doubling of the respiratory rates and greater oil concentrations caused a depression in rate. During the depuration period, many of the hydrocarbons present in clam tissue were again found to be methyl substituted naphthalene isomers. The respiratory rates of all groups of oil-exposed clams remained altered from the controls, but the magnitude of difference tended to decline toward the controls. (EIS-Deal)
W78-11683

ALTERATIONS IN GROWTH AND PHYSIOLOGY OF SOFT-SHELL CLAMS, MYA ARENARIA, CHRONICALLY OILED WITH BUNKER C FROM CHEDABUCTO BAY, NOVA SCOTIA, 1970-76,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
E. S. Gilfillan, and J. H. Vandermeulen.
Journal of the Fisheries Research Board of Canada, vol. 35, p630-636, 1978. 4 fig., 3 tab., 21 ref.

Descriptors: *Oil, *Clams, *Animal physiology, *Growth rates, *Animal metabolism, *Sediments, Oil spills, Oil pollution, Organic compounds, Lagoons, Population, Path of pollutants, Water pollution effects, Metabolism, Mya, *Tissue analysis.

Two populations of soft-shell clam, one from a chronically oiled lagoon (since the Arrow oil spill in 1970) and the other from a nonoiled lagoon, were compared as to population structure, growth and metabolism. The oiled lagoon sediments contained up to 3800 miacrograms/g oil and clams up to 200 micrograms/g hydrocarbon in their tissues. The oiled population of clams differed from the nonoiled population in lower total numbers with fewer mature adults, a 1-2 yr lag in tissue growth, a lower shell gorwth rate, and a reduced carbon flux with a lower assimilation rate. Results are interpreted to indicate that the recovery potential of M. arenaria in these oiled sediments is low and that these oiled populations remain under conditions of continued stress 6 yr after the Arrow spill. (EIS-Deal)
W78-11684

AVOIDANCE CHAMBER RESPONSES OF MAYFLY NYMPHS EXPOSED TO EIGHT HERBICIDES,
Fish and Wildlife Service, Denver, CO. Fish-Pesticide Research Lab.
L. C. Folmer.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 3, p 312-318, 1978. 3 tab, 4 ref.

Descriptors: *Rainbow trout, *Animal behavior, *Fish behavior, Aquatic insects, *Mayflies, *Herbicides, *Pesticide toxicity, *Diquat, *Copper sulfate, *2,4-D, *Dalapon, *Pesticide residues, Water pollution effects, Path of pollutants, *Avoidance, *Acrolein, *Aquathol K, *Roundup(Pesticide).

Because movement (stream drift) or death of insects may have a deleterious influence on the nutrition of a resident fishery, it was important to determine whether a representative insect world, like fry of rainbow trout, avoid some of the most commonly used herbicides. The avoidance behavior of mayfly nymphs was analyzed under three concentrations of eight herbicides. Mayfly

nymphs avoided the highest test concentration of copper sulfate, diquat, and Roundup, but did not avoid the other herbicides at the experimental concentrations tested. (EIS-Deal)
W78-11685

UPTAKE, METABOLISM, AND EXCRETION OF DDT BY THE FRESH WATER SNAIL, VIVIPARA HELICIFORMIS,
Delhi Univ. (India). Dept. of Zoology.
D. V. Yadav, H. C. Agarwal, and M. K. K. Pillai.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 3, p 300-306, 1978. 6 fig, 7 ref.

Descriptors: *DDT, *DDD, *DDE, *Chlorinated hydrocarbon pesticides, *Pesticide kinetics, *Animal metabolism, *Snails, Pesticide residues, Path of pollutants, Animal physiology, Mollusks, Vivipara.

Snails were exposed under laboratory conditions to three concentrations of DDT (0.005, 0.01, and 0.05 ppm). All snails accumulated the DDT rapidly. The total DDT in the snails after 24 hours was 1.5, 3.25, and 3.78 ppm respectively. DDD and DDE were the only two metabolites detected in the snails. After transfer to aquaria containing uncontaminated water, the DDT and its metabolites were excreted very rapidly in the first 24 hours (75%). (EIS-Deal)
W78-11686

HEPATIC PATHOLOGY IN A FRESH-WATER TELEOST CHANNA PUNCTATUS (BLOCH) EXPOSED TO SUB-LETHAL AND CHRONIC LEVELS OF THREE ORGANOPHOSPHOROUS INSECTICIDES,
University of the Pubjab, Lahore (Pakistan). Dept. of Zoology.
M. A. Anees.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 5, p 524-527, 1978, 1 tab, 8 ref.

Descriptors: *Organophosphorous pesticides, *Diazinon, *Insecticides, *Pesticide toxicity, *Pesticide kinetics, *Toxicity, *Animal pathology, *Teleosts, *Cytological studies, *Fish physiology, *Animal metabolism, Organic compounds, Pesticides, Path of pollutants, *Parathion, *Dimethoate, Tissue analysis, Liver.

The three insecticides investigated (Diazinon, Methyl Parathion and Dimethoate) produced detectable liver injury at both high and low concentrations. The same concentrations of these insecticides have already been observed to cause many. tissue changes in the intestine and disturbances in the distribution of serum proteins. The available evidence indicates that similar symptoms developed in fish liver after exposure to organophosphates.
W78-11687

A SURVEY OF THE MACROFAUNA OF A COAL-WASTE POLLUTED LANCASHIRE FLUVIAL SYSTEM,
University Coll. of Wales, Aberystwyth. Dept. of Zoology.
J. P. Greenfield, and M. P. Ireland.
Environmental Pollution, vol. 16, 1978, p105-122. 5 tab., 3 fig., 55 ref.

Descriptors: *Benthos, Animal populations, *Water pollution effects, Iron, Industrial wastes, *Coal mine wastes, *Coal mines, Freshwater fish, Bethos, Aquatic environment, Aquatic insects, Iron, Oligochaetes, Sediments, Lead, Zinc, Copper, Ammonia, Lancashire, Burnley, *Coal mine polluted river, *Iron hydroxide, Blanketing effects.

The effect of coal mine spoils in the Burnley area of Lancashire on the pollution of adjacent rivers was investigated from 1974 to 1975. Areas of the rivers studied showed heavy deposits containing iron hydroxide which blanketed the substratum. The macroinvertebrate community above the site of pollution showed a high diversity. At the site of deposition of iron compounds there was a reduction in diversity to oligochaetes and the larvae of chironomids. The blanketing effect of the iron compounds seemed to be the most important factor in this depletion. Four species of fish were found above the site of pollution: bullhead, minnow, stickleback, and stoneloach. At the site of moderate pollution minnows and bullheads were no longer found and in the area of heavy pollution no fish were taken. Caging experiments indicate that physical pollution was the limiting factor. There was no subsequent recovery of C. gobio and P. phoxinus downstream of te source of heavy pollution and C aculeatus and N. barbatulus only appeared after the polluted river was joined by the River Calder. The macroinvertebrate community showed signs of some recovery. (EIS-Katz)
W78-11688

SURVIVAL AND REPRODUCTIVE SUCCESS OF BLACK DUCKS FED METHYL MERCURY,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
M. T. Finley, and R. C. Stendell.
Environmental Pollution, vol. 16, 1978, p51-64. 4 tab., 2 fig., 28 ref.

Descriptors: *Mercury, Heavy metals, *Toxicity, Mortality, Bioassay, *Bird eggs, *Black ducks, Water pollution effects, Path of pollutants, *Animal pathology, Animal growth, Animal physiology, Reproduction, Feeds, Hatching, Ducks(Wild), *Anas rubripes, Clutch size, Egg production, Hatchability, Survival, Ducklings, Brain lesions, *Mercury poisoning.

A diet containing 3 ppm mercury was fed to black ducks (Anas rubripes) for periods of 28 weeks during two consecutive breeding seasons. Clutch size, egg production, number of eggs incubated, hatchability, and survival of ducklings were lower during both years in hens fed mercury. Reduced hatchability and poor duckling survival were the most harmful effects. During 2 years, 13 pairs of breeders fed mercury produced only 16 ducklings that survived 1 week compared with 73 ducklings from 13 pairs of controls. Mercury residues in eggs, embryos, and ducklings averaged about 30% lower during the secnd breeding season compared with the first year results. Third eggs laid by treated hens contained a mean of 6.14 and 3.86 ppm mercury during the first and second years. Whole embryos that failed to hatch contained means of 9.62 and 6.08 ppm mercury during the first and second years. Brans of dead ducklings contained between 3.25 and 6.98 ppm mercury and exhibited lesions characteristic of mercury poisoning. Relative tissue mercury levels for treated adult breeders were: feathers greater than liver greater than kidney greater than breast muscle greater than brain. Mercury levels in males and females did not differ. (EIS-Katz)
W78-11689

THE EFFECTS OF A POLYCHLORINATED BIPHENYL (AROCLOR 1254) ON THE WHITE PELICAN: ULTRASTRUCTURE OF HEPATOCYTES,
South Dakota State Univ., Brookings. Dept. of Veterinary Science.
I. J. Stotz, and Y. A. Greichus.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 3, p 319-325, 1978. 2 fig, 1 tab, 12 ref.

Descriptors: *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, *Pesticide toxicity, *Toxicity, *Pesticide residues, *Cytological studies, *Animal pathology, *Animal physiology, *Animal metabolism, *Electron microscopy, Path of pollutants, Pesticides, Mode of action, Tissue analysis, Bioaccumulation, Liver, *Pelicans.

Nine test birds were given a controlled dosage of PCBs while nine more birds served as controls. Liver cells were subsequently analyzed for pathological changes. Comparison of ultrastructural morphological characteristics indicated a 22% greater hepatocyte size in the treated birds. Hepatocytes from treated pelicans had significantly greater numbers of mitochondria and vacuoles and significantly fewer cristae per mitochondria than controls. (EIS-Deal)
W78-11690

PETROLEUM HYDROCARBONS IN MARINE SEDIMENTS AND ANIMALS FROM THE ISLAND OF MALTA,
Bristol Univ. (England). Dept. of Inorganic Chemistry.
For primary bibliographic entry see Field 5B.
W78-11691

PRUDHOE CRUDE OIL IN ARCTIC MARINE ICE, WATER, AND SEDIMENT ECOSYSTEMS: DEGRADATION AND INTERACTIONS WITH MICROBIAL AND BENTHIC COMMUNITIES,
Louisville Univ., KY. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-11693

DISTRIBUTION AND ABUNDANCE OF HYDROCARBON-UTILIZING BACTERIA IN SEDIMENTS OF CHEDABUCTO BAY, NOVA SCOTIA, IN 1976,
Fisheries and Marine Service, Halifax (Nova Scotia).
For primary bibliographic entry see Field 5B.
W78-11694

EFFECTS OF AROCLOR 1248 AND 1260 ON THE FATHEAD MINNOW (PIMEPHALES PROMELAS),
Environmental Research Lab.-Duluth, MN.
D. L. DeFoe, G. D. Veith, and R. W. Carlson.
Journal of the Fisheries Research Board of Canada, vol. 35, p997-1002, 1978. 4 tab., 3 fig., 11 ref.

Descriptors: *Toxicity, Bioassay, Freshwater fish, Minnows, *Aroclor, *Polychlorinated biphenyls, Juvenile fish, Fish eggs, Reproduction, Larvae, Fathead minnows, PCB's, Aroclor 1248, Aroclor 1260, Pimephalus promelas, *Bioconcentration, Chronic toxicity, Depuration.

Fathead minnows were exposed to Aroclor 1248 and 1260 in flow-through bioassays to determine the acute (30-d) and chronic (240-d life cycle) effects on the larvae and adults, as well as the bioconcentration of the mixtures of PCBs in the fish. Newly hatched larvae (less than 8 h old) were the most sentitive; the calculated 30-d LC50 was 4.7 micrograms/L for Aroclor 1248 and 3.3 microgram/L for Aroclor 1260. Reproduction in fathead minnows occurred at concentrations as high as 3 micrograms/L for Aroclor 1248 and 2.1 microgram/L for Aroclor 1260, concentrations that significantly affected larval survival. The 20% reduction in the standing crop in the second-generation fish at concentrations as low as 0.4 microgram/L was due to the death of the larvae soon after hatching. The bioconcentration factor for PCBs was independent of the PCB concentration in the water; in adult females at 25 C it was approximately 1.2 x 105 for Aroclor 1248 and 2.7 x 105 for Aroclor 1260. Females accumulated about twice as much PCBs as the males because of the greater amount of lipid in the female. Exposed fish placed in untreated Lake Superior water eliminated less than 18% of the body burden after 60d. (EIS-Katz)
W78-11695

AROMATIC HYDROCARBONS IN BENTHIC ORGANISMS FROM COASTAL AREAS POLLUTED BY IRANIAN CRUDE OIL,
Institute of Marine Research, Bergen (Norway).
For primary bibliographic entry see Field 5B.
W78-11696

TRACE ELEMENTS IN THE FLESH AND LIVER OF TWO FISH SPECIES FROM POLLUTED AND UNPOLLUTED AREAS OF THE AEGEAN SEA,
Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept.
For primary bibliographic entry see Field 5B.
W78-11697

EFFECTS OF CHRONIC EXPOSURE TO PETROLEUM UPON THE GROWTH AND MOLTING OF JUVENILES OF THE ARCTIC MARINE ISOPOD CRUSTACEAN MESIDOTEA ENTOMON,
Fisheries and Marine Service, Ste. Anne de Bellevue (Quebec). Arctic Biological Station.
J. A. Percy.
Journal of the Fisheries Research Board of Canada, vol. 35, p650-656, 1978. 2 fig., 2 tab., 19 ref.

Descriptors: *Oil, *Growth rates, *Juvenile growth stage, *Isopods, *Mortality, *Toxicity, Oil pollution, Oil spills, Organic compounds, Growth stages, Crustaceans, Benthic fauna, Water pollution effects, Animal physiology, Animal metabolism, *Crude oil, Mesidotea, Molting, Water-soluble fractions.

Juveniles of the benthic marine isopod Mesidotes entomon were chronically exposed to different concentrations of water-soluble fraction of fresh and weathered Norman Wells crude oil and of fresh Pembina crude for 160 D. The 100% extracts conained 1.72, 1.12, and 0.56 pm of oil (determined fluorimetrically), respectively. Most of the animals completed five or six molts before the end of the experiment. Long-term mortality was high in the 100% extracts of the oils, but most of the animals molted at least once before dying. None of the deaths occurred in conjunction with the molt. Stimulation of the onset of the subsequent molt occurred in some exposure groups. A significant increase in the duration of the intermolt period only occurred at the highest oil concentrations. Effects on growth were slight at concentrations lower than that which is lethal during chronic exposure. (EIS-Deal)
W78-11698

BEHAVIOR OF DDT, POLYCHLORINATED BIPHENYLS (PCB'S), AND DIELDRIN AT VARIOUS STAGES OF REFINING OF MARINE OILS FOR EDIBLE USE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
R. F. Addison, M. E. Zinck, R. G. Ackman, and J. C. Sipos.
Journal of the American Oil Chemists' Society, vol. 55, p391-394, April 1978. 2 tab., 24 ref.

Descriptors: *Pesticide residues, *DDT, *DDD, *DDE, *Polychlorinated biphenyls, *Dieldrin, *Commercial fish, *Marine fish, *Path of pollutants, *Public health, *Food processing industry, *Herring, Chlorinated hydrocarbon pesticides, Pollutants, Organoleptic properties, Fish oil, Marine oils, Margarine, Herring oils.

Two 300-lb. batches of Eastern Canadian herrin (Clupea harengus) oil were subjected to pilot plant processing to margarine stock for edible use. Samples were taken at various stages during processing for analysis of residues of the insecticide DDT and its meta bolites DDD and DDE, of polychlorinated biphenyls (PCBs) and of dieldrin. Residue concentrations in the oil were not affected by degumming (phosphoric acid wash), alkali refining, or bleaching with activated earth. DDT and dieldrin were readily and completely destroyed by commercial hydrogenation over Ni catalyst, and DDD was largely removed at the same time. DDE and PCBs were partially reduced during hydrogenation in the one run in which DDD was completely removed, but were unaffected in another run, in which DDD was only partially removed. Deodorization of the oil with steam and vacuum effectively removed those residues which survived hydrogenation. Analysis of the Ni catalyst before and after hydrogenation showed that removal of residues during hydrogenation was not due to their adsorption to the catalyst, but was more probably due to metal-catalyzed degradation to unidentified products. Deodorizer condensates showed only a slight enrichment in residue levels over those found in the oil. (EIS-Katz)
W78-11699

EFFECTS OF PHOSPHORUS FROM APATITE ON DEVELOPMENT OF FRESHWATER COMMUNITIES,
Waterloo Univ. (Ontario). Dept. of Biology.
E. A. Smith, C. I. Mayfield, and P. T. S. Wong.
Journal of the Fisheries Research Board of Canada, vol. 34, p2405-2409, 1977. 1 tab, 5 fig, 22 ref.

Descriptors: *Nutrients, Environmental effects, Biological communities, *Phosphorous. *Phosphates, Aquatic algae, *Nitrogen, *Oligotrophy, *Productivity, *Biomass, Zooplankton, Mineralogy, Laboratory tests, Phosphorous compounds, Crystals, Water quality, Nutrient requirements, Carbon cycle, Erosion, *Apatite, *Hydroxyapatite, *Fluorapatite.

Phophorus-free nutrients were added to three epilemnetic (pH 7.8) 40-L taks. Apatite crystals (30-100 microns) were added at loading rates of 30, 2, and 0 mg/day. After a 60-day incubation at 20C, levels of particulate organic carbon, particulate nigroten, and particulate organic phosphorus in Tank 1 increased from 0.42, 0.090, and 0.015 to 6.10, 0.820, and 0.430 micrograms/ml, respectively. This increase was due to the proliferation of algae, bacteria, and zooplankton and did not occur in the tank with only P-free nutrients. Algae and bacteria grew extensively on the surfaces of apatite crystals causing crystals to aggregate. Zooplankton increases followed those in algae and bacteria, and grazing was restricted to the areas around the apatite crystals. Results suggest that the contribution of soluble ortho-phosphate from apatite to the P-cycle of aquatic environments would be more important under oligotrophic conditions than in areas receiving high loadings of athropogenic phosphate, particularly where high erosion increases apatite loadings. (EIS-Katz)
W78-11700

PRELIMINARY ECOLOGICAL-GENETIC COMPARISON BETWEEN UNPERTURBED AND OIL-IMPACTED UROSALPINX CINEREA (PROSOBRANCHIA: GASTROPODA) POPULATIONS: NOBSKA POINT (WOODSHOLE) AND WILD HARBOR (WEST FALMOUTH), MASSACHUSETTS,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
T. J. Cole.
Journal of the Fisheries Research Board of Canada, vol. 35, p 624-629, 1978. 4 fig, 22 ref.

Descriptors: *Oil, *Population, *Genetics, *Ecology, *Biological communities, Oil pollution, Oil spills, Mortality, Enzymes, Organic compounds, Electrophoresis, Water pollution effects, Oyster drill, Urosalpinx, Demography.

Catastrophes, whether natural or man-made, impinge on populations of organisms by increasing mortality, thus reducing population numbers. Recent theoretical studies indicate that demographic and genetic changes may result from such events. The 1969 oil spill at Wild Harbor offered an opportunity to obtain empirical data on this relationship between ecology and genetics. The organism studied was the oyster drill. Monthly samples were collected for each of 3 yr from the recolonizing population and from a long-standing population. Genotypes at two allozymic loci were determined. Demographic information was obtained by mark-recapture experiments during 1973-75. Ana+yses of population dynamics indicated that a reasonably functioning population has been reestablished at Wilder Harbor. However, genetic structure (as revealed by genotypic distributions) of Wild Harbor drills exhibited generally greater year-to-year variation than did Nobska orgtanisms. This may have resulted from genetic change caused by gene migration from different co-adapted gene complexes and from stochastic 'founder' effects. More information on the interdigitation of ecology and genetics is needed, however, before implications of these findings are fully realized. (EIS-Deal)
W78-11701

UPTAKE OF HYDROCARBONS FROM MARINE SEDIMENTS CONTAMINATED WITH PRUDHOE BAY CRUDE OIL: INFLUENCE OF FEEDING TYPE OF TEST SPECIES AND AVAILABILITY OF POLYCYCLIC AROMATIC HYDROCARBONS,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
G. Roesijadi, J. W. Anderson, and J. W. Blaylock.
Journal of the Fisheries Research Board of Canada, vol. 35, p608-614, 1978. 1 fig, 3 tab, 22 ref.

Descriptors: *Oil, *Absorption, *Bottom sediments, *Aromatic compounds, *Food habits, *Animal metabolism, *Animal physiology, Oil pollution, Oil spills, Organic compounds, Sediments, Benthic fauna, Path of pollutants, *Crude oil, Bivalves, Macoma, Phascolosoma, Protothaca, Tissue analysis, Bioaccumulation.

Selected benthic animals were exposed to marine sediments contaminated with Prudhoe Bay crude oil, and uptake of hydrocarbons was monitored under various experimental schemes. When uptake of aliphatic and diaromatic hydrocarbons by two deposit feeders, Macoma inquinata and Phascolosoma agassizii, was compared with that of a suspension feeder, Protothaca staminea, we found that the deposit feeders generally accumulated hydrocarbons to a greater extent that the suspension feeder. However, other factors, such as the intrinsic capabilities of species to accumulate hydrocarbons, also played an important role in the extent of contamination. Hydrocarbon concentrations in the bivalve species increased during the 60-d exposure period; whereas concentrations in the sipunculid appeared to have reached an equilibrium relatively early in the exposure. (EIS-Deal)
W78-11702

IMPORTANCE OF SEDIMENT WORKING BY THE DEPOSIT-FEEDING POLYCHAETE ARENICOLA MARINA ON THE WEATHERING RATE OF SEDIMENT-BOUND OIL,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
D. C. Gordon, Jr., J. Dale, and P. D. Keizer.
Journal of the Fisheries Research Board of Canada, vol. 35, p 591-603, 1978. 8 fig, 13 tab, 24 ref.

Descriptors: *Oil, *Bottom sediments, *Worms, *Food habits, *Microbial degradation, *Absorption, Oil spills, Oil pollution, Organic compounds, Sediments, Gas chromatography, Fluorescence, Spectroscopy, Biodegradation, *Polychaetes, Tissue analysis, Bioaccumulation, Arenicola.

The interactions between the polychaete Arenicola marina, a common deposit-feeder in

sandy intertidal areas, and sediment contaminated with fresh reference oils and weathered Bunker C oil remaining from the 1970 Arrow spill were investigated in laboratory experiments. Worms can tolerate low concentrations of sediment-bound oil, although the sediment working rate is reduced upon oil type, concentration, and degree of weathering. Hydrocarbon concentrations, measured gravimetrically and by gas chromatography and fluorescence spectroscopy, were substantially lower (17-72%) in worm casts than in initial sediment. This loss can be accounted for by microbial degradation, which is stimulated by the worms' activity, uptake of hydrocarbons into worms, and perhaps dissolution. (EIS-DEal)
W78-11703

TEMPERATURE AND WATER VELOCITY EFFECTS ON THE SWIMMING PERFORMANCES OF YOUNG-OF-THE-YEAR STRIPED MULLET (MUGIL CEPHALUS), SPOT (LEIOSTOMUS XANTHURUS), AND PINFISH (LAGODON RHOMBIDIES),
North Carolina State Univ., at Raleigh. Dept. of Zoology.
R. A. Rulifson.
Journal of the Fisheries Research Board of Canada, vol. 34, p2316-2322, 1977. 3 tab, 3 fig, 16 ref.

Descriptors: Environmental effects, *Fish behavior, *Mullets, *Entrainment, *Water temperature, *Swimming, *Velocity, *Currents(Water), Aquatic environment, Commercial fish, Sport fish, Laboratory tests, Estuarine environment, Movement, Water circulation, Water velocity, *Swimming behavior, Mugil, Leiostomus, Lagodon, Pinfish.

Swimming performances of young-of-the year striped mullet (Mugil cephalus), spot (Leiostomus xanthurus), and pinfish (Lagodon rhomboides) were tested by examination of the combination of physical endurance and swimming behavior to provide information on potential fish entrapment and impingement problems at industrial intakes. Tests were conducted at three temperatures (15-25C) and six water velocities (12-48 cm/s). Fish lengths ranged from 1.4 to 7.0 cm TL. Fish tested at high temperatures exhibited increased time for steady swimming and for impingement avoidance. Temperature was also positively correlated with maximum swimming speeds and with the number of bursts performed during drift-burst activity (drifting with the current and returning upstream with a burst of swimming). Increased water velocities resulted in decreased times of steady swimming and impingement avoidance, and reduced drift-burst activity. Larger fish avoided impingement longer and had faster maximum swimming speeds; however, smaller fish showed stronger rheotaxis and swam steadily for longer periods at equal water velocities. Abnormally heavy mullet and spot had reduced capabilities for position maintenance (steady swimming) which may decrease their ability to avoid impingement. (EIS-Katz)
W78-11704

EFFICACY OF CERTAIN DISINFECTANTS AGAINST INFECTIOUS PANCREATIC NECROSIS VIRUS,
Washington Univ., Seattle. Coll. of Fisheries.
D. G. Elliott, and D. F. Amend.
Journal of Fish Biology, Vol. 12, p. 277-286, 1978. 8 tab, 19 ref.

Descriptors: *Fish diseases, *Aquiculture, *Viruses, Viricides, Rainbow trout, Bioassay, Chlorine, Iodine, Iodides, Pathology, Hardness(Water), Mercury, *Disinfection, Hydrogen ion concentration, *Disinfectants, Iodophor, *Formalin, *Organic mercurial compounds, *Infectious pancreatic necrosis.

The virucidal properties of iodopher, chlorine (sodium hypochlorite), formalin, thimerosal (organic mercurial compound), malachite green, and acriflavine were tested on infectious pancreatic necrosis virus (IPNV). Iodine and chlorine showed good activity, but efficacy depended on the concentration of virus, the presence of oganic matter (calf serum), and water pH. Water hardness (0-300 mgl-1 as CaCO3) did not affect virucidal activity. (EIS-Katz)
W78-11705

INTERACTION OF IONIZED AND UN-IONIZED AMMONIA ON SHORT-TERM SURVIVAL AND GROWTH OF PRAWN LARVAE, MACROBRACHIUM ROSENBERGII,
California Univ., Davis. Hydrobiology Lab.
D. A. Armstrong, D. Chippendale, A. W. Knight, and J. E. Colt.
Biological Bulletin, Vol. 154, p. 15-31, 1978. 5 fig., 2 tab., 50 ref.

Descriptors: *Aquiculture, *Commercial shellfish, *Shrimp, Bioassay, Toxicity, Mortality, Laboratory tests, *Ammonium compounds, Animal physiology, Animal pathology, Growth, Juvenile growth stage, Methodology, Hydrogen ion concentration, *Macrobrachium.

The toxicity of ammonia to Marcrobrachium larvae was tested at pH 6.83, 7.60, and 8.34, and the respective 144 hr 1050 values were 80, 44, and 14 mg ammonia/liter. Toxicity of ammonia was not due solely to the NH3 molecule. In solutions of different pH equal NH3 concentrations, survival was greatly reduced as NH4+ levels increased. A model is proposed to explain the differential effect of amonia as pH varies. At higher pH (8.4) toxicity results from copious diffusion of NH3 into larvae. At lower pH (6.8) toxicity is thought to result from competitive inhibition of Na+ transport by NH4+. Retardation of growth was documented in sublethal concentrations of smmonia at 6.8 and 7.6. The average dry weight was about 26% less than that of controls (P less than 0.05) after a seven day exposure. Results are discussed relevant to the culture and maintenance of crustaceans, and it is concluded that ammonia will not pose a substantial threat in adequately managed systems. (EIS-Katz).
W78-11706

DISRUPTION OF PRECOPULATORY BEHAVIOR IN THE AMPHIPED ANISOGAMMARUS PUGETTENSIS UPON EXPOSURE TO BLEACHED KRAFT PULPMILL EFFLUENT,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
J. C. Davis.
Water Research, Vol. 12, p. 273-275, 1978. 1 fig., 14 ref.

Descriptors: *Amphipoda, *Bioassay, *Animal behavior, *Pulp wastes, Pulp and paper industry, Bleaching wastes, Reproduction, Sockeye salmon, Toxicity, Mortality, Crustacieans, Industrial wastes, Water pollution sources, *Copulatory behavior.

Marine amphipods in precopula were used in statid 117 h bioassays with neutralized, filtered bleached kraft pulp mill effluent (BKME) and daily solution replacement. The effluent interfered with precopula behavior; high concentrations (40% of full strenght BKME) resulted in rapid release of paired amphipods. A concentration-related time to 50% release of paired individuals was observed. For one batch of BKME the behavioral threshold concentration (E050) was estimated at 10-15% of full strenght BKME. The estimated 96 h LC50 for underyearling coho salmon (Oncerhychus kisutch) for the same effluent tested in freshwater was 36% BKME - illustrating a greater sensitivity of the amphiped behavioral bioassay in comparison to the salmonid acute lethal toxicity test. The amphiped precopula bioassay for toxicity testing has some merit in that it is moderately quantitative under given test conditions and does not require elaborate equipment. (EIS-Katz).
W78-11707

UPTAKE OF WATER-SOLUBLE GASOLINE FRACTIONS AND THEIR EFFECT ON OXYGEN CONSUMPTION IN AQUATIC STAGES OF THE MOSQUITE (AEDES AEGYPTI (L.),
Vermont Univ., Burlington. Dept. of Zoology.
For primary bibliographic entry see Field 5G.
W78-11710

INTERACTION OF CHEMICAL POLLUTANTS AND VIRUS IN A CRUSTACEAN: A NOVEL BIOASSAY SYSTEM,
Environmental Protection Agency, Gulf Breeze, FL. Gulf Breeze Environmental Research Lab.
J. A. Couch, and L. Courtney.
Annals of the New York Academy of Sciences, Vol. 298, p. 497-504, 1977. 6 fig, 9 ref.

Descriptors: *Viruses, *Aroclors, *Animal parasites, Polychlorinated biphenyls, Animal pathology, Mortality, Shrimp, Absorption, Bioassay, Infection, Toxicity, Hosts, Pesticides, Bioaccumulation, Tissue analysis.

A large group of shrimp, 23.3% of which has light Baculovirus infections, was divided equally into two groups. One group was exposed to the chemical stressor Aroclor 1254 (a polychlorinated biphenyl) at 0.7 ppb for 35 days in flowing seawater. The other group was maintained as a control group in flowing seawater. Viral presence in exposed shrimp samples increased with time at a significantly greater rate than did viral frequency in control shrimp. Viral prevalence in Aroclor-exposed shrimp survivors was 75% after 35 days, whereas in control shrimp, only 45.7% had patent viral infections. This finding suggests an interaction along chemical stressor (Aroclor 1254), host and virus. The nature or mechanism of this interaction has not been defined, but the shrimp virus system shows promise for future bioassays of influence of low concentrations of pollutants on natural pathogen-host interactions. (EIS-Katz)
W78-11712

DISTRIBUTION OF NEOPLASMS AND OTHER DISEASES IN MARINE FISHES RELATIVE TO THE DISCHARGE OF WASTE WATER,
Southern California Coastal Water Research Project El Segundo.
A. J. Mearns, and M. J. Sherwood.
Annals of the New York Academy of Sciences, Vol. 298, p. 210-224 1977. 2 fig, 7 tab, 37 ref.

Descriptors: *Fish diseases, *Demersal fish, Industrial wastes, Municipal wastes, Outfall sources, Animal pathology, DDT, Water pollution sources, Toxicity, Fish populations, Polychlorinated biphenyls, Aromatic compounds, Organic compounds, *Neoplasms, *Microstomus, *Dover sole, *Fin erosion.

This study was based on an examination of approximately 290,000 fishes that comprised 151 species collected from southern California coastal waters. Approximately 5% of the fishes were affected with external signs of disease, such as fin erosion, tumors, color abnormalities, and attached macropharasites. Fin erosion diseases were reported in the greatest number of species and occurred at the highest frequencies. Unlike the fin erosion disease, the tumor diseases in this report do not appear to be unrelated to single municipal waste water discharge or to other discrete sources of pollutants. The prevalence of lip papillomas in white croaker was apparently higher in past years than in recent years, and this tumor was found primarily in fish caught off the coasts of Orange and Los Angeles Counties. The occurrence of skin tumors on young Dover sole covers an even wider geographic area, and the disease is quite similar to

that which affects pleuronectids as far north as Bristol Bay, Alaska. The lack of association with specific waste discharge conditions coupled with an apparent relation to the life cycle of the Dover sole suggest that changes in waste discharge practices will have little impact on the prevalence of these tumors unless the changes affect survival rates and distributional patterns of young fish. (EIS-Katz)
W78-11713

A LONG-TERM STUDY OF THE EFFECTS OF WATER-SOLUBLE FRACTIONS OF NO. 2 FUEL OIL ON THE SURVIVAL, DEVELOPMENT RATE, AND GROWTH OF THE MUD CRAB RHITHROPANOPEUS HARRISII,
Texas A and M Univ., College Station. Dept. of Biology.
R. B. Laughlin, Jr., L. G. L. Young, and J. M. Neff.
Marine Biology, Vol. 47, p 87-95, 1978. 4 fig, 3 tab, 32 ref.

Descriptors: *Oil, *Oil pollution, *Crabs, *Growth rates, *Toxicity, Oil spills, Organic compounds, Fuels, Growth stages, Larval growth stage, Crustaceans, Mortality, Water pollution effects, Bioassay, *Zoeae, *Naphthalenes, Survival.

Mud Crabs were exposed continuously for 6 months after hatching to water-soluble fractions (WSF) of No. 2 fuel oil. The zoeal stages were the most sensitive to fuel oil. Of the zoeal stages, the first stage appeared to be the most sensitive. The combined duration of the 4 zoeal stages was significantly increased by increasing WSF exposure concentrations. The megalopa and crab stages were particularlay sensitive, particularly when compared to zoeal stages. However, mean duration of the megalopa and first crab stages was significantly affected by oil exposure. Individuals which survived the highest exposure concentrations as larvae appeared to grow larger during the crab stages, so that at the end of 6 months comparably staged crabs were equal to or larger than both control crabs and those exposed to low WSF concentrations. The data indicate that these crabs possess considrerable ability to recover from the effects of chronic sublethal exposure to petroleum hydrocarbons. The most deleterious effects of oil pollution on this species may be due to its impact on larval recruitment into the adult population. (EIS-Katz)
W78-11715

BIOCHEMICAL CORRELATES OF DISSOLVED MERCURY UPTAKE BY THE OYSTER OSTREA EDULIS,
Southampton Univ. (England). Dept. of Oceanography.
J. J. Wrench.
Marine Biology, Vol. 47, p. 79-86, 1978. 4 fig, 3 tab, 18 ref.

Descriptors: *Biochemistry, *Oyster, *Mercury, *Animal metabolism, Proteins, Metabolism, Absorption, Potassium, Metals, Heavy metal, Animal physiology, Water pollution effects, Path of pollutants, Biological membranes, Tissue analysis, *Ostrea.

From previous work, the equilibrium concentration factor for dissolved mercury in the digestive gland of Ostrea edulis was found to be three to four times higher than that of the gills. In the present study, an analysis of soluble protein revealed values of 49.3 plus or minus 14.2 mg g wet tissue -1 for the digestive gland and 0.7 plus or minus 0.1 mg g wet tissue -1 for the gills. Starvation significantly reduces the soluble protein level of the digestive gland to 31.1 plus or minus 6.4 mg g -1 and that of the gills to below the limit of detection. These results suggest that the difference in concentration factors betwen the gills and digestive gland may be based on a quantitative difference in macromolecular binding sites. (EIS-Katz)
W78-11716

METABOLISM OF AROMATIC HYDROCARBONS IN MARINE ORGANISMS,
National Marine Fisheries Service, Seattle, WA.
D. C. Malins.
Annals of the New York Academy of Sciences, Vol. 298, p. 482-496, 1977. 4 fig, 3 tab, 42 ref.

Descriptors: *Animal metabolism, *Aromatic compounds, *Enzymes, Biochemistry, Organic compounds, Oil, Fuels, Oysters, Marine animals, Metabolism, Fish physiology, Salmonids, Gas chromatography, Cytological studies, Chemical analysis, Bioaccumulation, *Depuration.

This discussion evaluates the status of our understanding of aromatic hydrocarbons metabolism in marne life, particularly with respect to the enzyme systems involved and the nature of the products formed. Representative findings in the areas of tissue accumulation and depuration and metabolic enzyme systems were summarized. (EIS-Katz)
W78-11717

THE FATE AND EFFECT OF PETROLEUM IN CONTROLLED ECOSYSTEM ENCLOSURES,
Skidaway Inst. of Oceanography, Savannah, GA.
For primary bibliographic entry see Field 5B.
W78-11718

EFFLUENTS FROM CATFISH PONDS DURING FISH HARVEST,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5A.
W78-11719

EFFECTS OF INSECTICIDES, OIL DISPERSANTS AND SYNTHETIC DETERGENT ON THE EMBRYONIC DEVELOPMENT IN MEDAKA, ORYZIAS LATIPES,
K. Hirose, and K. Kawakami.
Bulletin of the Tokai Regional Fisheries Research Lab. No 91, p. 9-17, 1977. 4 fig, 3 tab, 14 ref.

Descriptors: *Embryonic growth stage, *Insecticides, Growth stages, Growth rates, Reproduction, Linear alkylate sulfonates, Water pollution effects, Toxicity, Mortality, DDT, Diazinon, Pesticide toxicity, *Dispersants.

This study was undertaken to learn the effects of insecticides (DDT, PAP, and diaginon), oil dispersants (No. 2 and No 5) and LAS on the embryonic development of medaka, Oryzias latipes. In the fertilized eggs exposed to DDT (0.04, 0.004 and 0.0004)ppm) the embryonic developments were retarded at stage such as development of vascular system or observation of melanin in eyes. Mean day from fertilization to hatching also showed considerably high values in DDT groups. The embryonic development in diaginon was similar to that in the control. But hatching rates were reduced in 5 and 1 ppm diaginon. No. 2 did not effect the developing embryos, whereas, No. 5 showed a severe effect. The experiment was also carried out to learn whether some observed abnormal responses to sublethal exposures to PAP, diazinon, No. 5 and LAS were due to the period of incubation or due to the effect followed by hatching. (EIS-Katz)
W78-11720

WHAT NORTH SEA OIL MIGHT COST FISHERIES,
Marine Lab., Aberdeen (Scotland).
R. Johnston.
Rapports et Proces-Verbaux des Reunions, Conseil International Pour L'Exploration de la Mer, Vol 171, p. 212-223, 1977. 2 fig, 10 tab, 9 ref.

Descriptors: *Water pollution effects, *Marine fisheries, *Oil industry, *Food webs, *Fish behavior, *Toxicity, Oil fields, Exploitation, Natural gas, Primary productivity, Biodegradation, Oil spills, Commercial fishing, Inhibitors, Food chains, Biological communities, Commercial fish, Commercial shellfish, *North Sea.

There is an urgent need for a reasoned assessment of the impact of oil and oil-related developments on the fisheries of the North Sea. The available information is inadequate for a valid simulation and instead a number of theoretical relationships are assumed between fish production and its underlying food web. On this basis, taking into account of the more important proven or probable modes of action of North Sea oil, a tentative appraisal is made of the possible loss as equivalent fish resulting from oil spillages of various magnitudes and probabilities. The physical encumbrance of oil-related developments on fishing is then assessed. A third factor is natural gas exploitation and its attendant risks and interferences. Losses reckoned as fish production or its approximate cash equivalent are shown to be small even for a catastrophic oil spill. Physical obstruction to fishing might be construed as a more serious interference. (EIS-Katz)
W78-11721

APPARENT EFFECTS OF FLOODING ON DISTRIBUTION AND LANDINGS OF INDUSTRIAL BOTTOMFISH IN THE NORTHERN GULF OF MEXICO,
National Marine Fisheries Service, Pascagoula, MS. National Marine Fisheries Center.
For primary bibliographic entry see Field 2L.
W78-11722

ACUTE TOXICITY OF NITRITE TO LARVAE OF THE GIANT MALAYSIAN PRAWN, MACROBRACHIUM ROSENBERGII,
California Univ., Davis. Dept. of Land, Air and Water Resources.
D. A. Armstrong, M. J. Stephenson, and A. W. Knight.
Aquaculture, Vol 9, p. 39-46, 1976. 2 fig, 2 tab, 20 ref.

Descriptors: *Toxicity, *Bioassay, *Nitrites, *Larval growth stage, *Lethal limit, *Shellfish, Growth rates, Laboratory tests, Nitrogen compounds, Larvae, Crustaceans, Invertebrates, Aquiculture, Water quality, Water pollution effects, *Shrimp, *Macrobrachium rosenbergii, *Sublethal effects.

Static bioassays of up to 8 days duration were performed on 10-14 day old larvae ranging in weight from 80 to 140 micro gr/larva. The 24-, 96- and 192-h LC50 values were 130, 8.6, and 4.5 mg NO2-N/l respectively. The highest concentrations of nitrite in which no mortality were observed were 9.7 and 1.4 mg/l in a 24- and 168-h period. There was a significant difference in weight of control larvae compared with those exposed to 1.8 mg/l for 8 days. (EIS-Katz)
W78-11723

ENVIRONMENTAL CARCINOGENESIS STUDIES IN FISHES OF THE GREAT LAKES OF NORTH AMERICA,
Guelph Univ. (Ontario). Dept. of Microbiology.
R. A. Sonstegard.
Annals of the New York Academy of Sciences, Vol 298, p. 261-269, 1977. 38 ref.

Descriptors: *Chemical wastes, *Great lakes, *Animal pathology, *Suckers, *Carp, *Viruses, *Epizootiology, Toxicity, Mortality, Industrial wastes, Municipal wastes, Water supply, Water sources, Water pollution, Potable water, *Carcinogenesis, *Neoplasms, Tumors.

A survey of over 50,000 fish revealed epizootics of gonadal tumors in carp, goldfish, and carp x goldfish hybrids and papillomas in white suckers. Several large museum collections taken prior to 1952 exhibited no gonadal tumors while samples from the same geographic area 25 years later revealed tumor frequencies as high as 100% in older males. It was hypothesized that PCBs and/or DDT may be involved in the tumor etiology. White sucker papillomas were also found to be widespread. A virus-chemical synergy was proposed as the mechanism of tumor development. The role of extensive industrial chemical pollution in animal and human carcinogenesis was also discussed. (EIS-Katz)
W78-11724

MASS MORTALITY AMONG MINNOWS PHOXINUS PHOXINUS (L.) IN LAKE TVEITEVATN, NORWAY, DUE TO AN ABERRANT STRAIN OF AEROMONAS SALMONICIDA,
National Veterinary Inst. Oslo (Norway).
T. Hastein, S. J. Saltveit, and R. J. Roberts.
Journal of Fish Diseases, Vol 1, p. 241-249, 1978. 1 tab, 6 fig, 7 ref.

Descriptors: *Mortality, *Fish kill, *Fish diseases, Fish physiology, Pathology, Freshwater fish, Bacteria, *Hydroelectric power, Minnows, Laboratory tests, Methodology, Brown trout, *Mass mortality, Phoxinus phoxinus, Lake Tveitevatn, Norway, Aeromonas salmonicida, Clinical features.

Mass mortality in minnows Phoxinus phoxinus (L.) was investigated in the Vinje water system, southern-central Norway. The main clinical feature was the development of extensive haemorrhagic skin lesions from which was isolated a non-pigmented, fish-pathogenic strain of Aeromonas salmonicida. (EIS-Katz)
W78-11725

TISSUE LESIONS OF TIGER SALAMANDERS (AMBYSTOMA TIGRINUM): RELTIONSHIP TO SEWAGE EFFLUENTS,
Texas Tech Univ., Lubbock. Dept. of Biological Sciences.
F. L. Rose.
Annals of the New York Academy of Sciences, Vol 298, p. 270-279, 1977. 2 fig, 1 tab, 24 ref.

Descriptors: *Salamanders, *Sewage lagoons, *Playas, *Aromatic compounds, Amphibians, Sewage treatment, Sewage effluents, Life history studies, Growth stages, Larval growth stage, Organic compounds, Fuels, Cytological studies, Toxicity, Mortality, *Tissue analysis, *Neoplasms, *Carcinogens, *Perylene.

A population of facultative neotenous tiger salamanders inhabiting a sewage lagoon at Reese AFB, Hurlwood, Texas, was found to have an exceptionally high rate of spontaneous skin lesions. The population is composed of an estimated 28,000 large, reproductively mature larvae that are restricted to the lagoon. Only about 17% of the population metamorphoses normally. In contrast, tiger salamanders from uncontaminated lagoons in the same general vicinity metamorphose normally; however, no neoplasms were discovered in larvae sampled from the non-sewage lagoons. Nitrosamine analyses of water and tissue samples of larvae were negative. Polycyclic aromatic hydrocarbons analyses revealed traces of benzo(a)pyrene in the sludge; however, perylene, a constituent of jet fuel, was found in high concentration (330 ppb). These results indicate that perylene, which was previously found not to be tumorigenic to mice and rats, should be retested as a possible agent for nonmammalian species. (EIS-Katz)
W78-11726

SURVIVAL AND OXYGEN CONSUMPTION OF PRAUNUS FLEXUOSUS AND NEOMYSIS INTERGER, AND EMBRYONIC DEVELOPMENT OF THE LATTER SPECIES, IN DIFFERENT TEMPERATURE AND CHLORINITY COMBINATIONS,
Delta Inst. of Hydrobiological Research, Yerseke (Netherlands).
A. G. Vlas Blom, and J. H. B. W. Elgershuizen.
Netherlands Journal of Sea Research, Vol 11, No 3-4, p. 305-315, 1977. 5 fig, 2 tab, 19 ref.

Descriptors: *Embryonic growth stage, *Growth rates, *Animal physiology, *Environmental effects, *Water temperature, *Respiration, *Copepods, Resistance, Aquatic habitats, Invertebrates, *Crustaceans, Hatching, Growth stage, Temperature, Growth rates, *Chlorine, *Praunus, Neomysis.

Laboratory tests show that both Neomysis integer and Praunus flexuosus have wide tolerance ranges for salinity. Praunus tolerates higher salinities than Neomysis though the two species show considerable overlap. Praunus is more susceptible to the effects of high temperature than Neomysis. The greater tolerance of Neomysis to low salinity as well as to high temperature makes this species better adapted to habitats in which this combination of environmental factors occurs than Praunus. (EIS-Katz)
W78-11729

SOME LETHAL AND SUB-LETHAL EFFECTS IN CRANGON CRANGON AT EXPERIMENTAL K+ ENRICHMENT OF THEIR ENVIRONMENT,
Netherlands Inst. voor Onderzoek der Zee, Texel.
E. L. M. White-Maas, and D. H. Spaargaren.
Netherlands Journal of Sea Research, Vol 11, No 3-4, p. 316-324, 1977. 5 fig, 6 ref.

Descriptors: Environmental effects, *Bioassay, *Potassium, *Shrimps, *Mortality, *Salinity, *Water temperature, Shellfish, Toxicity, Lethal limits, Temperature, Animal physiology, Laboratory tests, Ions, Invertebrates, Crustaceans, Animal behavior, Crangon crangon, *Sublethal effects, Heart rate.

Experiments are described in which some effects in shrimps, Crangon crangon are studied when KOl is added to sea water of various salinities at low and high temperature. Dependent on concentration, sudden changes in environmental K+ concentration, especially at extreme salinities, appeared to be harmful. The results are explained in terms of the capabilities of shrimps to regulate their internal K+ concentrations. (EIS-Katz)
W78-11730

NEOPLASIA IN SOFT-SHELL CLAMS (MYA ARENARIA) COLLECTED FROM OIL-IMPACTED SITES,
Environmental Research Lab., narragansett, RI.
P. P. Yevich, and C. S. Barszcz.
Annals of the New York Academy of Sciences, Vol 298, p. 409-426, 1977. 12 fig, 4 tab, 9 ref.

Descriptors: *Clams, *Oil spills, *Animal pathology, Oil pollution, Water pollution effects, Maine, Cytological studies, Reproduction, Animal physiology, Fuels, Toxicity, *Tissue analysis, *Neoplasms, Carcinogens.

Clams collected from two Maine oil spill sites have consistently shown neoplasms. While gross examination failed to reveal any abnormalities, microscopic examination found reproductive system neoplasms in both males and females. The neoplasms, which were found in from 1 to 22% of sampled specimens, were highly malignant. It was concluded that the neoplasms were the result of some alteration in the animals' environment. Laboratory tests attempting to link the neoplasms with the specific oils spilled are in progress. (EIS-Katz)
W78-11731

ENVIRONMENTAL SIGNIFICANCE OF FIN EROSION IN SOUTHERN CALIFORNIA DEMERSAL FISHES,
Southern California Coastal Water Research Project El Segundo.
M. J. Sherwood, and A. J. Mearns.
Annals of the New York Academy of Sciences, Vol 298, p. 177-189, 1977. 3 fig, 5 tab, 22 ref.

Descriptors: *Demersal fish, *Fish diseases, Fish physiology, Industrial wastes, Municipal wastes, Outfall sewers, DDT, Polychlorinated biphenyls, Bottom sediments, Organic compounds, Animal pathology, Toxicity, Bottom fish, *Fin erosion, Microstomus, Dover sole, Tissue analysis.

Fin lesion in Microstomus pacificus were characteriszed by a minimal inflammatory response and by the absence of associated microorganisms. The fish most frequently affected were those most often in contact with bottom sediments. Diseased specimens from the shelf had higher levels of total DDT and a tendency toward higher levels of total PCB in muscle tissue and a greater liver to body weight ratio than did unaffected specimens from the same area. Laboratory exposure of M. pacificus to contaminated sediments from the shelf resulted in the development of fin erosion. Chlorinated hydrocarbon levels and liver weight to body weight ratios in the exposed fish approached those measured in fish from the shelf. These studies suggest that the role of chlorinated hydrocarbons should be tested directly in future experiments. (EIS-Katz)
W78-11732

ON THE METABOLIC ADAPTATION OF CARCINUS MAENAS TO REDUCED OXYGEN TENSIONS IN THE ENVIRONMENT,
Nederlands Inst. voor Onderzoek der Zee, Texel.
D. H. Spaargaren.
Netherlands Journal of Sea Research, Vol 11, No 3-4, p. 325-333, 1977. 3 fig, 13 ref.

Descriptors: *Crabs, *Respiration, *Animal physiology, *Anaerobic conditions, Oxygen sag, *Water temperature, Crustaceans, Invertebrates, Oxygen, Environmental effects, Temperature, Metabolism, Laboratory tests, Oxygen consumption, Stress.

Data are given for the oxygen consumption, heart rate and relative blood ion concentration in the shore crab, Carcinus maenas, during periods of reduced oxygen pressure and anoxic conditions in its environment. Down to values of about 20 mm Hg pO2, Carcinus regulates oxygen uptake. The oxygen uptake is more strongly influenced by temperature than heart rate. Anoxic conditions can be survived during about two days. During anoxia apparently internal changes occur, causing the animals to loose locomotory control. Ion regulatory capabilities are, however, unaffected. Up to a certain time these internal changes are reversible; then a slow recovery takes place when the normal environmental oxygen concentration is restored. (EIS-Katz)
W78-11735

ACID PRECIPITATION IN NORWAY: EFFECTS ON AQUATIC FAUNA,
Norsk Inst. for Vannforskning, Blindern.
G. R. Hendrey, and R. F. Wright.
Journal of Great Lakes Research, Vol 2, Sup 1, p. 192-207, 1976. 3 fig, 45 ref.

Descriptors: Hydrogen ion concentration, *Acidic water, *Acidity, *Air pollution, *Air pollution effects, Nutrients, Nitrates, Phosphates, Sulfates, Phytoplankton, Zooplankton, *Primary productivity, Freshwater fish, Salmonids, *Fish kills, Mortality, *Acid precipitation, *Norway.

The effects of acid precipitation on the aquatic fauna of Norwegian lakes and streams are reviewed. Among subjects discussed are the effects on water chemistry, especially pH, sulfate, nitrate, and phosphate concentration. Acid precipitation has resulted in severs damage to fish populations of all kinds especially salmonids. Massive fish kills are observed particulary in the spring. The acidification of the fresh waters severely affects the invertebrate fauna so that the numbers of species are reduced, food chains are shortened and the population levels fluctuate erratically. Both zooplankton and phytoplankton are adversely affected. (EIS-Katz)
W78-11737

THE EFFECTS OF OIL ON LOBSTERS,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
J. Atema.
Oceanus, Vol 20, No 4, p. 67-73, 1977. 5 fig, 5 ref.

Descriptors: *Animal behavior, *Oil, Oil spills, *Water pollution effects, *Lobsters, Maine animals, Commercial shellfish, Laboratory tests, Methodogy, *Bioassay, Mortality, Kerosene, La Rosa Crude Oil, No. 2 Fuel Oil, *Feeding behavior.

Petroleum hydrocarbons are acutely toxic to the lobster, Homarus americanus. They react in a variety of abnormal ways when exposed to different concentrations of these hydrocarbons, ranging from death throes, and spastic-like behaviors to critical delays in feeding responses. The effects upon the behavior of lobsters to kerosene, La Rosa crude oil and Number 2 fuel oil were investigated in the laboratory. (EIS-Katz)
W78-11739

DISTRIBUTION OF 1-14C-HEXADECANE IN THE LOBSTER, HOMARUS AMERICANUS, AT VARIOUS TIMES AFTER INJECTION INTO THE PERICARDIAL SINUS,
National Inst. of Environmental Health Sciences, Research Triangle Park, NC.
For primary bibliographic entry see Field 5B.
W78-11741

SURVIVAL AND REPRODUCTION OF GAMMARUS LACUSTRIS AND G. PSEUDOLIMNAEUS UNDER TWO EXPERIMENTAL CONDITIONS,
Environmental Research Lab.-Duluth, MN.
B. J. Halligan.
The Progressive Fish Culturist, Vol 40, No 2, p. 59-62, 1978. 2 tab, 16 ref.

Descriptors: *Methodology, Laboratory tests, *Laboratory animals, *Crustaceans, Amphipods, Zooplankton, Environment, *Aquiculture, Fish food organisms, Juvenile growth stages, Mortality, Populations, *Reproduction.

Life-cycle tests on the survival and reproduction of the amphipods Gammarus lacustris and G. pseudolimnaeus were conducted under two nontoxicant experimental conditions: with several amphipods per tank and with individual pairs per tank. Juvenile and adult survival of the two species was similar with several amphipods per tank, but was higher for G. lacustris among the the reproducing larval pairs. In the multiple-animal tanks G. lacustris females had larger broods than did G. pseudolimnaeus females and both species produced more young per female and more broods per female than in the tanks with individual pairs. Our results indicate that these amphipods may be reared more successfully with several animals per tank than with only two. Of the two species, G. lacustris may be preferred for use in chronic toxicity tests because of its greater fecundity, larger size, and wider distribution. (EIS-Katz)
W78-11742

NEOPLASMS IN ESTUARINE MOLLUSKS AND APPROACHES TO ASCERTAIN CAUSES,
National Marine Fisheries Service, Oxford, MD.
C. A. Farley.
Annals of the New York Academy of Sciences, Vol 298, p. 225-232, 1977. 1 fig, 1 tab, 20 ref.

Descriptors: *Animal pathology, *Dieldrin, *Pesticide toxicity, *Clams, *Animal diseases, Mollusks, Mortality, Pesticides, Toxicity, Chlorinated hydrocarbon pesticides, Cytological studies, Bacteria, Macoma, *Neoplasms, *Carcinogens, Tissue analysis.

This report describes a method for maintaining a detritus-feeding bivalve mollusk, Macoma balthica, for extended periods under controlled laboratory conditions, and reports on observations of an initial attempt to expose clams to the chlorinated hydrocarbon dieldrin. Histopathologic studies of exposed animals demonstrated the presence of numerous naturally occurring diseases, some of which are probably highly pathogenic. Dieldrin-fed populations showed evidence of increased hyperplasia of the kidney and other tissues, possibly indicating stimulation of proliferative activity by the pesticide. Because hyperplasia usually precedes neoplastic transformation a longer study might have produced more definitive results concerning induction of neoplasms. (EIS-Katz)
W78-11743

A TECHNIQUE FOR PREDICTING IN-STREAM FLOW REQUIREMENTS OF BENTHIC MACROINVERTEBRATES,
Montana Univ., Missoula. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W78-11744

THE TOXICITY OF PURE HYDROCARBONS TO MUSSEL LARVAE,
Universite de Bretagne-Occidentale, Brest (France).
S. Le Roux.
Rapports et Proces-Verbaux, des Reunions, Conseil International Pour L'Exploration de la Mer, Vol 171, p. 189-190, 1977. 5 fig.

Descriptors: *Organic compounds, *Mussels, *Larval growth stage, *Toxicity, *Growth rates, *Adsorption, Molluscs, Crustaceans, Invertebrates, Water pollution effects, Bioassay, Laboratory tests, *Oil, Oil spills, *Sub-lethal effects.

Larvae of mussels (Mytilus edulis) were exposed to five pure hydrocarbons at concentrations ranging from 1 to 100 ppm for short and extended periods of time. Growth rates of larvae exposed to 100 ppm surpassed controls organisms. Decalin inhibited growth at all concentrations, while the rate of growth increased with increased concentrations of isopropyl benzine and cyclohexane. The reason for this stimulation of growth is not known. (EIS-Katz)
W78-11745

SAND DOLLAR EMBRYOS AS MONITORS OF ENVIRONMENTAL POLLUTANTS,
Trinity Coll., Hartford, CT.
For primary bibliographic entry see Field 5A.
W78-11747

CHANNELIZATION AND INVERTEBRATE DRIFT IN SOME IOWA STREAMS,
Iowa State Univ., Ames. Dept. of Animal Ecology.
D. W. Zimmer, and R. W. Bachmann.
Water Resources Bulletin, Vol 14, No 4, p. 868-883, August, 1978. 7 fig, 3 tab, 24 ref.

Descriptors: *Invertebrates, Aquatic habitats, Biological communities, *Channel improvement, Streams, *Channel morphology, Channels, Biomass, Environmental effects, Productivity, Aquatic environment, Distribution patterns, Fish food organisms, Benthos, Depth velocity, *Des Moines River(Iowa), *Channelization, *Channel sinuousity.

Habitat diversity and invertebrate drift were studied in a group of natural and channelized tributaries of the upper Des Moines River during 1974 and 1975. Channelized streams in this region had lower sinuousity index values than natural channel segments. There were significant positive correlations between channel sinuosity and the variability of water depth and current velocity. Invertebrate drift density, expressed as biomass and total numbers, also was correlated with channel sinuosity. Channelization has decreased habitat variability and invertebrate drift density in streams of the upper Des Moines River Basin and probably has reduced the quantity of water stored in streams during periods of low flow. (EIS-Katz)
W78-11748

THE EFFECTS OF TEMPERATURE ON THE DEVELOPMENT AND MORTALITY OF EGGS OF PERCH, PERCA FLUVIATILIS,
Freshwater Biological Association, Windemere (England).
S. A. Guma'a.
Freshwater Biology, Vol 8, p 221-227, 1978. 2 tab, 5 fig, 27 ref.

Descriptors: *Perches, *Water temperature, *Mortality, *Fish eggs, *Embryonic growth stage, *Hatching, Temperature, Environmental effects, Laboratory tests, Fish reproduction, Reproduction, Growth rates.

The rate of development and mortility of perch Perca fluviatilis was studied at ten different constant temperatures. The rate of development was inversely related to the incubation temperature, whereas the rate of mortality was directly related to the incubation temperature. The sum of heat (degree-days) required for 10, 50 and 90% of the eggs to hatch was found to be constant, regardless of the incubation temperature, with mean values (with 95% confidence limits) of 91.4 (83.3-102.0) degree-days above 4.6C for 10% hatched, 97.0 (90.9-104.2) degree-days above 4.9C for 50% hatched and 101.0 (94.3-108.7) degree-days above 5.0C for 90% hatched. Mortality among the different embryological stages was highest for the pre-hatching stage (i.e. when eye-pigment has been formed) at all temperatures. High mortality among the early stages occurred at temperatures below 8C and above 12C. (EIS-Katz)
W78-11749

TOXICITY, BOD AND COLOR OF EFFLUENTS FROM NOVEL BLEACHING PROCESSES,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong, M. Le Bourhis, M. Wostradowski, and S. Prahacs.
Pulp and Paper of Canada, Vol. 79, No. 7, p 41-47, July, 1978. 6 fig, 8 tab, 26 ref, 2 append.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Bleaching wastes, *Toxicity, *Chlorination, Biochemical oxygen demand, Chemical oxygen demand, Color, Recycling, Mathematical models, Waste water treatment, Industrial wastes.

The toxicity to fish, BOD, and COD of effluents from five soft and hardwood pulp bleaching processes were measured in a laboratory study. The techniques employed CED, DPD, OCE, ODE, and OCE bleaching sequences; four of the processes used gaseous reagents and two employed rapid press caustic extraction. An equation for calculating the net volume of pollutants discharged to a sewer, incorporating the recycling of bleaching effluents, was derived as a function of the net effluent volume discharged, the concen-

tration of the pollutant, the fraction of filtrate recycled, and the number of completed cycles. Toxicity was measured in toxic units (TU) which were calculated from the ratio of effluent toxicant concentration to lethal threshold concentration of the toxicant. The OED bleaching sequence was found to produce the lowest toxicity and also the lowest BOD, COD, and color of all the sequences examined. Toxicity increased significantly because of chlorine residuals in chlorine bleaching effluents. The use of gaseous chlorine reduced the toxicity of the effluents compared to conventional aqueous chlorination practices; toxicity also increased through the formation of chlorinated organics. The use of chlorine dioxide produced little or no residual chlorine or chlorinated organics, thereby reducing toxicity. Effluents from rapid press caustic extraction sequences were found to be less toxic than effluents from conventional processes; oxygen bleaching did not reduce toxicity but did result in lower values for BOD, COD, and color. The ODE sequence reduced COD by 75-82% and BOD by 82-83%. (Lisk-FIRL)
W78-11782

NITRIFICATION AND OTHER FACTORS AFFECTING NITROGEN IN THE HOLSTON RIVER,
Tennessee Valley Authority, Chattanooga.
R. J. Ruane, and P. A. Krenkel.
Journal Water Pollution Control Federation, Vol. 50, No. 8, p 2016-2028, August, 1978. 8 fig, 3 tab, 41 ref.

Descriptors: *Nitrification, *Denitrification, Rivers, *Reservoirs, *Nitrogen fixing bacteria, Dissolved oxygen, Nitrates, Ammonia, Nitrites, Nitrogen, Nitrogen cycle, Industrial wastes, Biochemical demand, Nitrogen compounds, Oxygen sag, Waste water treatment, Municipal wastes, *Holston River(Tenn), Tennessee.

Recent Studies measured nitrification and dentrification in the Holston River near Kingsport, Tennessee; factors influencing these processes and the impact of nitrogen on the Cherokee Reservoir near Jefferson City were also evaluated. Along the 151.3 km stretch of the river studies, total nitrogen inputs to the river included 82 kg/day by a sewage treatment plant, 27 kg/day by a paper mill, 2,497 kg/day by an ammunition plant, and 7,312 kg/day by a chemical plant. Dissolved oxygen, pH, temperature, benthic oxygen demand, and standing crops of attached aquatic plants were measured in river samples; the rates of change in ammonia, nitrate, and nitrite levels within the various stream reaches were used to calculate the oxidation rate for nitrogeous BOD. Significant nitrification did not occur until river mile 137.9 and was attributed to nitrifying bacteria requiring up to 10 days to generate; denitrification occurred in the upstream reaches were nitrofiers were absent. The point of observed nitrofication, occurring after about 0.2 days, corresponded to the critical dissolved oxygen sag. Oxygen depletion in the Cherokee Reservoir was dependent upon influent oxygen demand, decomposition of aquatic weeds, ammonia regeneration by zooplankton, fish excretions, and overall biological respiration. (Lisk-FIRL)
W78-11786

LARGE EUNICE HARASSII AUDOUIN AND MILNE-EDWARDS FROM A SLUDGE DISPOSAL AREA,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
A. J. M. Walker.
Proceedings of the Royal Irish Academy, Section B: Biological, Geological and Chemical Science, Vol. 77, No. 9, p 175-179, 1977. 3 fig, 8 ref.

Descriptors: *Sludge disposal, *Annelids, *Benthic fauna, *Growth rates, *Environmental effects, Worms, Sewage sludge, Bays, Sludge worms, Sampling, Municipal wastes.

Four polychaete specimens, identified as Eunice harassii Audouin and Milne-Edwards, found in Ireland's Dublin Bay where sewage sludge is discharged, were larger and had more branchial filaments than other specimens previously documented. The appearance of Eunice harassii had not been previously recorded in Irish waters. The maximum number of branchial filaments on specimens found in earlier studies had been 15; Eunice specimens collected in Liverpool Bay, Menai Bridge, and Museum specimens from the English Channel had up to 26 filaments. The four Dublin Bay anelids had maximum filament numbers of 24, 30, 32, and 34; setiger widths for three of the four specimens were in the 8-10 mm range. The fragmented worms were found in Dublin Bay at a depth of about 30 m in an area receiving about 140,000 wet tons/yr primary sewage sludge; the enrichment of the area was thought to be a primary factor in the large size of the Eunice harassii. (Lisk-FIRL)
W78-11829

BIOASSAYS-PROCEDURES AND RESULTS,
Research Triangle Inst., Research Triangle Park, NC.
For primary bibliographic entry see Field 5A.
W78-11834

ANTIBIOTIC RESISTANCE PATTERN OF SALMONELLA WELTEVERDEN STRAINS ISOLATED FROM MAN, ANIMALS, SEWAGE AND WATER,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Coll. of Veterinary Medicine.
For primary bibliographic entry see Field 5A.
W78-11842

TOXICITY-TEST ON FISH CARASSIUS AURATUS IN WATERS AND SEWAGES CONTAINING PHENOL, TREATED WITH NACLO OR WITH CLO2 (IL TEST DI ITTIOTOSSICITA' SU ACQUE E LIQUAMI DEPURATI CON IPOCLORITO E BIOSSIDO DI CLORO, IN PRESENZA DI FENOLO),
Naples Univ. (Italy). Dept. of Hygiene and Science.
For primary bibliographic entry see Field 5A.
W78-11845

THE TURBULENT TRANSPORT AND BIOLOGICAL STRUCTURE OF EUTROPHICATION MODELS. VOLUME I, PRESERVING THE STATISTICAL STRUCTURE IN LAKE TRANSPORT CALCULATIONS,
Ohio State Univ., Columbus, Dept. of Civil Engineering.
K. W. Bedford, R. M. Sykes, and C. Babajimopolous.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 391, Price codes: A11 in paper copy, A01 in microfiche. Ohio Water Resources Center, Columbus, Completion Report No. 527X, May 31, 1978. 225p, 75 fig, 5 tab, 127 ref, 4 append. OWRT A-039-OHIO(1) B-063-OHIO(2).

Descriptors: *Model studies, *Lakes, *Reservoirs, *Circulation, *Turbulence, Limnology, *Fluid mechanics, Diffusion, *Computer models, Fourier analysis, Time series analysis, Stochastic processes, *Eutrophication, Path of pollutants.

Turbulence so seriously effects the transport of pollutants that a study was undertaken to derive and implement a lake circulation and pollutant transport model which preserves the detailed spectral structure of the turbulent fluctuation during computations made with a coarse grid work. The three dimensional rigid lid, shallow water wind driven governing equations include inertial effects but exclude thermal stratification. A spatial filtering technique derived and applied to the equations and a time splitting formulation of the pressure and velocity equations was derived. Source wink terms for the transport equations were formulated from simple first order kinetics. The results indicate that for a stochastically correct wind shear a fully three dimensional turbulence structure will never be possible within rigid lid lake models. Further, it is absolutely necessary that higher order filtering be applied, not only are the statistics calculable but this allows the use of a viscosity formulation that is grid size dependant and which eliminates the need for continuous updating of eddy viscosity coefficients. The intensity of the source sink term does not affect the overall concentration of pollutants for one day periods, the turbulence and circulation fields do however. (See also W78-11864).
W78-11863

THE TURBULENT TRANSPORT AND BIOLOGICAL STRUCTURE OF EUTROPHICATION MODELS. VOLUME II, COMPARATIVE STUDY OF THE MATHEMATICAL FORMULATIONS FOR PRIMARY PRODUCTIVITY IN STRATIFIED LAKES,
Ohio State Univ., Columbus, Dept. of Civil Engineering.
R. M. Sykes, K. W. Bedford, and K. L. Smarkel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 392, Price codes: A11 in paper copy, A01 in microfiche. Ohio Water Resources Center, Columbus, Completion Report No. 527 X, May 31, 1978. 209p, 25 fig, 15 tab, 147 ref, 4 append. OWRT A-039-OHIO(1) B-063-OHIO(2).

Descriptors: *Model studies, *Lakes, *Eutrophication, *Primary productivity, Food chains, Nutrients, Phytoplankton, Zooplankton, Thermal stratification, Ohio, Path of pollutants, *Canadarago Lake(Ohio), *Cayuga Lake(Ohio).

The ability of existing eutrophication models to reproduce high density spatial and temporal field data was tested in order to determine the minimal structural complexity needed in such models. Structural components studied included oxygen, benthal deposits, dissolved and suspended organic matter, nutrients, light, temperature, vertical thermal stratifications, diffusive transport and settling, zooplankton and algai. Algae were represented as having either constant phosphorus contents, or constant structural plus variable soluble and variable polyphosphate contents. Both mono-type and Lotka-Volterra-type kinetic formulas were used. these components represent all eutrophication models presently in use, except those incorporating multiple algae species. The models tested can reproduce only the spring bloom; they fail qualitatively to represent late summer conditions or during other seasons. The minimal set of structural components necessary to reproduce the spring bloom are: monod-type kinetics, nutrients (one-limiting), algae with constant phosphorus contents, zooplankton, settling and diffusion, benthal deposits, oxygen, dissolved organic matter and more complex representations on algae cellular phosphorus. (See also W78-11863).
W78-11864

AVOIDANCE BY HERRING OF DISSOLVED COMPONENTS IN PULP MILL EFFLUENTS,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
D. J. Wildish, H. Akagi, and N. J. Poole.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 5, p 521-525, November, 1977. 7 ref, 3 tab.

Descriptors: *Pulp wastes, *Water pollution effects, *Fish behavior, Herrings, Aquatic animals, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Sulfite liquors, Lignins, Effluents, Fish, Sulfite pulp mills,

Lignosulfonates, Humic acid, Glucose, Dehydroabietic acid, Fructose, Acetic acid, Formic acid, Abietic acid, Tall oil, Furfural, Catechol, Organic wastes, Organic acids, Organic compounds.

The soluble chemical components in pulp mill effluents which initiate avoidance or preference responses by herring (Clupea harengus) were identified. Analytical-grade sodium lignosulfonate and humic acid were avoided at about 1 mg/liter and their nominal concentration thresholds were estimated to be 0.1-0.3 and 0.1-0.2 mg/liter, respectively. Fish exposed to analytical-grade D-glucose and dehydroabietic acid showed a significant preference but the results could not be replicated. Control and experimental data were not significantly different for assays with analytical-grade fructose, acetic, formic, and abietic acids, tall oil, furfual, and catechol. Herring avoided sulfite mill effluent containing 1.2-1.9 mg/liter sodium lignosulfonate at a concentration threshold equivalent to 2.5-2.9 mg/liter. Possible explanations for the disagreement with the nominal concentration threshold estimated for analytical-grade sodium lignosulfonate are that herring respond to the chemical differences of the two lignosulfonate samples tested, or are affected by the masking of the lignosulfonate in sulfite mill effluent by other chemicals present. (Swichtenberg-IPC)
W78-11900

TOXICITY AND BOD OF EFFLUENTS DERIVED FROM THE THERMOMECHANICAL PULPING OF EASTERN CANADIAN WOOD SPECIES,
Pulp and Paper Research Inst. of Canada, Pointe Claire.
A. Wong, J. Costantino, D. Breck, D. Herschmiller, and J. G. Rae.
Canadian Pulp and Paper Association Technical Section, 64th Annual Meetin (Montreal), Preprints, p A197-205, January 31-February 3, 1978. 9 fig, 20 ref, 4 tab.

Descriptors: *Pulp wastes, *Toxicity, *Biochemical oxygen demand, Wastes, Industrial wastes, Water pollution sources, Foreign countries, Canada, Balsam fir trees, Spruce trees(Picea), Effluents, Pulp and paper industry, Water pollution effects, Water pollution, Thermomechanical pulping, Groundwood pulping, Resin acids, Organic acids, Pollutants.

A study by MacMillan Rothesay Ltd. (New Brunswick) and the Pulp and Paper Research Institute of Canada indicated that the toxicity and BOD of washer filtrates from thermomechanical and stone groundwood pulp samples (balsam fir/spruce furnishes) were comparable. Toxicity averaged 300 (toxic units X oven-dry ton of pulp) and BOD averaged 20 kg/oven-dry ton of pulp. These findings suggested that a newsprint mill operating on 100% thermomechanical pulp would not discharge effluents with significantly higher toxicity and BOD levels than a mill operating on stone groundwood and purchased semibleached kraft pulp. The toxicity of both thermomechanical pulping and stone groundwater effluents was apparently related to the resin acid content of the effluent. The chip washing operations at MacMillan Rothesay produced little or no toxicity and BOD. Most of the pollutants originated in the first refining stage of a two-stage thermomechanical pulping system. (Swichtenberg-IPC)
W78-11905

AN INVESTIGATION OF THE EXTENT OF RESIDUAL BIOSOLIDS DEPOSITION IN QUIESCENT RECEIVING WATERS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
H. S. Costa.
NCASI Stream Technical Bulletin, No 304, 14 p, February, 1978. 4 fig, 7 tab.

Descriptors: *Pulp wastes, *Suspended solids, *Water pollution effects, Wastes, Industrial wastes, Water pollution sources, Outfalls, Biological treatment, Pulp and paper industry, Effluents, Deposition(Sediments), Surface waters.

Data on the percent volatiles in core samples taken from the bottom of quiescent receiving waters adjacent to outfalls indicate that the suspended biosolids in biologicaly treated pulp and paper effluents have no definitive impact on the receiving waters. (Swichtenberg-IPC)
W78-11914

CORROSION IN CLOSED WHITE WATER SYSTEMS,
Institute of Paper Chemistry, Appleton, WI.
D. F. Bowers.
Tappi, Vol 61, No 3, p 57-61, March, 1978. 7 fig, 1 illus, 7 ref, 6 tab.

Descriptors: *Pulp wastes, *Industrial water, *White water(Paper machines), *Closed systems, *Corrosion, Wastes, Industrial wastes, Pulp and paper industry, Stainless steel, Sulfates, Chlorides, Hydrogen ion concentration, Temperature, Water pollution effects, Metals, Alloys, Water pollution sources, Pitting(Corrosion), Electrolytes.

A research program conducted by the Engineering Division of the Institute of Paper Chemistry (Appleton, Wisconsin) is designed to evaluate both uniform and localized corrosion of metals by recycled paper-machine white water in closed systems. Uniform corrosion test results for mild steel and Type 304 stainless steel in both real and simulated white water show the effects of pH, temperature, and chloride content. Preliminary results for localized corrosion of Types 304 and 316L stainless steel as a function of sulfate and chloride concentration in simulated white water are reported. Corrosion severity increases at sulfate/chloride ratios of 3:1 and less. An improvement in corrosion resistance for Type 316L compared to Type 304 stainless steel under crevice test conditions created by pulp deposits is indicated by these initial results. (Swichtenberg-IPC)
W78-11919

THE MUSSEL WATCH,
Scripps Institution of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5A.
W78-11957

DESORPTION OF RADIOACTIVITY FROM NEARSHORE SEDIMENT,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 5B.
W78-11961

THE DYNAMICS OF AN ESTUARY AS A NATURAL ECOSYSTEM,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
F. J. Vernberg, R. Bonnell, B. Coull, R. Dame, Jr., and P. DeCoursey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 357, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Research and Development, Ecological Research Series No EPA-600/3-77-016, January 1977. 95 p, 9 fig, 10 tab, 169 ref.

Descriptors: *Estuaries, *Ecosystems, *South Carolina, *Baseline studies, Water pollution effects, Salt marshes, Environmental effects, Resources development, Outer Continental Shelf, Spartina alterniflora.

A research program was initiated to understan the dynamics of a relatively undisturbed estuary marshland ecosystem, the North Inlet Estuary near Georgetown, South Carolina. The study consisted of two substudies: a macroecosystem substudy and a microecosystem substudy. The objectives of the macroecosystem study were to establish baseline data on an undisturbed estuary to provide a scientific basis for comparative studies on effects of various stresses of pollutants on other estuarine environments; and to develop models of an estuarine ecosystem which would predict probable effects of environmental perturbation. The principal objective of the microecosystem study was to develop and test replicate experimental salt marsh units at the microecosystem level as diagnostic tools for the assessment of both long- and short-term pollution effects on the Spartina alterniflora salt marsh community. A conceptual model of energy flow for the entire marsh-estuarine ecosystem was developed which consisted of three sub-models. A simulation of the water column submodel and a simulation by a linear systems model of an intertidal oyster community was completed. Much baseline data needed for model development is available on primary producers, zooplankton, meiofauna, benthic macrofauna, decomposers, and relevant physical parameters. (Sinha-OEIS)
W78-11966

ALGAL NUTRIENT AVAILABILITY AND LIMITATION IN LAKE ONTARIO DURING IFYGL, PART II, NITROGEN AVAILABLE IN LAKE ONTARIO TRIBUTARY WATER SAMPLES AND URBAN RUNOFF FROM MADISON, WISCONSIN,
Texas Univ. at Dallas.
W. F. Cowen, K. Sirisinha, and G. F. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 230, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/3-77-045, May 1977. 87 p, 28 fig, 11 tab, 30 ref, 2 append. 1BA608, R-800537-02.

Descriptors: *Lake Ontario, *Nutrients, *Nitrogen, *Organic compounds, *Inorganic compounds, *Tributaries, Great Lakes, Lakes, Rivers, Niagara River, Oswego River(NY), Genesee River(NY), Black River(NY), Madison(WI), Wisconsin, Algae, Ammonia, Bacteria, Nitrates, Aerobic conditions, Limiting factors, Mineralization, New York.

Analysis and incubation of water samples from four Lake Ontario tributaries--the Niagara, Genesee, Oswego, and Black Rivers--shows that, in general, over 50% of total nitrogen present is immediately available for algal growth or potentially available after mineralization by bacteria. Samples were collected in March-June 1973, analyzed for nitrogen forms, and incubated anaerobically in darkness to promote mineralization of soluble inorganic nitrogen from the organic nitrogen. Amounts of ammonia and nitrate were calculated as a function of incubation time. Results from each tributary were highly variable, and no single value was found which described total nitrogen availability in a given river. An effort was made to estimate available amounts of organic nitrogen; organic nitrogen availability was low in samples with high organic nitrogen concentrations. Direct estimation of particulate organic nitrogen availability by dark incubation of membrane-filterable particles yielded values which conflicted with availability data from incubations of unfiltered river water. Data on urban stormwater drainage samples from Madison, Wisconsin showed that over 80% of total nitrogen may be converted to an available form for algal growth in about 100 days. Further research is needed on such factors as solution temperature, mixing effects, and trace element composition which may influence available nitrogen. (See also W78-11993) (Lynch-Wisconsin)
W78-11992

ALGAL NUTRIENT AVAILABILITY AND LIMITATION IN LAKE ONTARIO DURING IFYGL, PART III, ALGAL NUTRIENT LIMITATION IN LAKE ONTARIO DURING IFYGL,
Wisconsin Univ.-Madison.
N. Sridharen, and G. F. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 293, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/3-33-046a, May 1977. 46 p, 17 fig, 5 tab, 1 ref. 1BA608 R-800537-02.

Descriptors: *Algae, *Limiting factors, *Nutrients, *Lake Ontario, *Phosphorus, *Genesee River(NY), *Niagara River, *Black River(NY), *Oswego River(NY), Phytoplankton, IFYGL, Great Lakes, Lakes, Rivers, Bioassay, Nitrogen, Tributaries, Metals, Poisons, Cladophora.

Water samples from five Lake Ontario stations and from the mouths of four tributaries in summer and fall 1972 and spring 1973 indicated phosphorus as the main factor limiting algal growth in the lake and in the Niagara and Black Rivers. By late summer both nitrogen and phosphorus limitation was indicated in the lake and in the Niagara River; Black River samples also indicated nitrogen limitation. In the Genesee River and most Oswego River samples nitrogen appeared to be the limiting factor, although some Oswego River samples showed limitation due probably to a toxic metal, the toxicity of which is eliminated by addition of EDTA, or possibly to a lack of micronutrients. The primary recommendation is that all municipalities with populations exceeding 1000 which contribute domestic wastewater to Lake Ontario or its tributaries, immediately initiate 90% phosphorus removal from the wastewater. Further research is needed in two major areas: (1) factors limiting growth of Cladophora, an attached alga causing serious water quality problems in Lake Ontario near the shore; and (2) clarification of limiting factors in the Genesee and Oswego Rivers, with particular attention to determining whether phosphorus input reduction to these waters would be sufficient to limit algal growth, and also to identification of toxicants which may be currently limiting growth. Standard algal assay procedures were used in this study. (See also W78-11993) (Lynch-Wisconsin)
W78-11993

SURVEY OF CHEMICAL FACTORS IN SAGINAW BAY (LAKE HURON),
Cranbrook Inst. of Science, Bloomfield Hills, MI.
V. E. Smith, K. W. Lee, J. C. Filkins, K. W. Hartwell, and K. R. Rygwelski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 680, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-600/3-77-125, October 1977. 142 p, 55 fig, 50 tab, 24 ref. R802685.

Descriptors: *Saginaw Bay(MI), *Lake Huron, *Eutrophication, *Water chemistry, *Water quality, Estuarine environment, Lakes, Great Lakes, Michigan, Remote sensing, Model studies, Chlorophyll, Data collections, Baseline studies, International Joint Commission, Winds, Nutrients, Oligotrophy, Circulation, Stratification.

Water quality as indicated by 15 biochemical parameters was surveyed in Saginaw Bay, Michigan (western Lake Huron) during 1974-75 as part of the International Joint Commission's Upper Lakes Reference Study. Objectives of the overall study were to establish a base of water quality information and provide data for modelling biological and hydrological processes in the bay. Findings indicate that highly eutrophic waters in the inner part of Saginaw Bay undergo complex mixing with oligotrophic Lake Huron waters in the outer bay; the bay is characterized by high primary production, active circulation, and frequent water level changes induced by wind stress. Thermal stratification apparently occurs only briefly during early spring, except in deep waters of the outer bay where a thermocline persists throughout the summer. Data indicate a significant improvement of most water quality parameters since 1965, especially in the inner bay (presumably due to decreased nutrient input rates). The Saginaw River system continues its adverse effect on bay water quality, though no parameters were consistently in violation of established standards. An eight-fold increase in chlorophyll-a concentrations from the outer to inner bay reflects nutrient enrichment. This study monitored temperature, dissolved oxygen, conductivity, chloride, pH, alkalinity, Secchi depth, chlorophyll, nitrate, phosphate, organic nitrogen, total phosphorus, organic carbon, total solids, and major metals. Remote sensing was useful in extrapolating water quality to unsampled areas. (Lynch-Wisconsin)
W78-11994

DISTRIBUTION OF PHYTOPLANKTON IN SOUTH CAROLINA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
S. C. Hern, J. W. Hilgert, V. W. Lambou, F. A. Morris, and M. K. Morris.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 451, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/3-77-102, September 1977. 64 p, 1 tab, 11 ref, 1 append.

Descriptors: *South Carolina, *Lakes, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Bioindicators, *Impoundments, *National Eutrophication Survey, Algae, Reservoirs, Distribution, Species diversity, Diversity indices, Species composition, Floral lists, Data collections, Fishing Creek Reservoir(SC), Lake Greenwood(SC), Lake Hartwell(SC), Lake Marion(SC), Lake Murray(SC), Lake Robinson(SC), Lake Wateree(SC), Lake Wylie(SC), Lake Moultrie(SC), Lake Keowee(SC), Lake Secession(SC), Lake William C. Bowen(SC), Saluda Lake(SC).

Phytoplankton species composition and abundance were determined for 13 South Carolina lakes and impoundments; trophic status was also assessed by means of several water quality indices, including Nygaard's five trophic state indices, Palmer's organic pollution indices, and species diversity and abundance indices. The study was conducted in spring, summer, and fall 1973 as part of the National Eutrophication Survey. Selection of sampling sites was based on actual or potential accelerated eutrophication problems as determined by three criteria: (1) contamination by sewage treatment plant effluents, (2) surface area of at least 40 ha, and (3) hydraulic retention time of at least 30 days. Lakes studied were Fishing Creek Reservoir, Lakes Greenwood, Hartwell, Marion, Murray, Robinson, Wateree, Wylie (Catawba), Moultrie, Keowee, Secession, and William C. Bowen, and Saluda Lake. Data are summarized in an appendix, containing alphabetical lists of phytoplankton species with concentrations of each by sampling date, and results of application of the indices. Nygaard's indices are based on algal groups known to be unique to eutrophic or oligotrophic waters. Palmer's indices, designed for water samples with high organic pollution, incorporate two lists of organic pollution-tolerant taxa, one with 20 genera, the other with 20 species. The Brillouin and Shannon/Weaver species diversity indices are also used. (Lynch-Wisconsin)
W78-11995

DISTRIBUTION OF PHYTOPLANKTON IN MISSISSIPPI LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
L. R. Williams, W. D. Taylor, F. A. Hiatt, S. C. Hern, and J. W. Hilgert.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 388, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/3-77-101, September 1977. 29 p, 3 tab, 11 ref, 1 append.

Descriptors: *Mississippi, *Lakes, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Bioindicators, *Impoundments, *National Eutrophication Survey, Algae, Reservoirs, Distribution, Species diversity, Diversity indices, Species composition, Floral lists, Data collections, Arkabutla Reservoir(MS), Enid Lake(MS), Ross Barnett Reservoir(MS), Sardis Lake(MS), Grenada Lake(MS).

Species composition and abundance of phytoplankton were determined for five Mississippi lakes and impoundments; trophic level was also assessed by means of various water quality indices, including Nygaard's five trophic state indices. Part of the National Eutrophication Survey, the study was conducted in spring, summer, and fall 1973. Selection of lakes was based on actual or potential accelerated eutrophication problems, determined by three criteria: (1) contamination by sewage treatment plant effluents, (2) surface area of at least 40 ha, and (3) minimum hydraulic retention time of 30 days. Sampling sites were Arkabutla Reservoir, Enid Lake, Ross Barnett Reservoir, Sardis Lake, and Grenada Lake. Data are summarized in an appendix which contains alphabetical phytoplankton species lists with concentrations of each species by sampling date, and results of application of the indices. Nygaard's indices are based on algal groups known to be unique to eutrophic or oligotrophic waters. Palmer's indices designed for water samples with high organic pollution, incorporate two lists of organic pollution-tolerant taxa, one with 20 genera, the other with 20 species. Each taxa is assigned a pollution index number. Components of Nygaard's and Palmer's indices are given in tabular form. (Lynch-Wisconsin)
W78-11996

ASSESSMENT OF THE EFFECTS OF NUTRIENT LOADINGS ON LAKE ONTARIO USING A MATHEMATICAL MODEL OF THE PHYTOPLANKTON.
Hydroscience, Inc., Westwood, NJ.
Report prepared for International Joint Commission, Windsor, Ontario, Canada, Great Lakes Water Quality Board. March 1976. 116 p, 38 fig, 19 tab, 22 ref.

Descriptors: *Phytoplankton, *Lake Ontario, *Nutrients, *Mathematical models, *Eutrophication, *International Joint Commission, Great Lakes, Lakes, Rivers, Niagara River, Lake Erie, Genessee River, Trent River, Tributaries, Algae, Simulation analysis, Model studies, Nutrient removal, Biomass, Chlorophyll, LAKE 1 model, Phosphorus, Nitrogen, International Commissions.

To determine potential effects of phytoplankton biomass levels in Lake Ontario of ongoing nutrient removal programs of the U.S.-Canadian Water Quality Agreement (W.Q.A.) for the Great Lakes, a series of mathematical modelling simulations were conducted. The study focused on five components: (1) data compilation and evaluation of historic nutrient loads to Lake Ontario (1967-74); (2) evaluation of 1974 phosphorus and nitrogen loads; (3) review of W.Q.A. loads, and preparation of alternative loading scenarios for simulation; (4) reduction of the scenarios to formats required by the LAKE 1 whole lake phytoplankton model; and (5) summarization and evaluation of LAKE 1 model simulations under the scenarios and drawing appropriate conclusions. Results represent trends and ranges only, and should not be interpreted as predictions of actual future phytoplankton biomass levels. Among conclusions are: (1) Simulations utilizing reasonable model kinetics indicate current peak phytoplankton concentrations are not in equilibrium with present nutrient loadings, and show a trend toward peak

chlorophyll levels 50-100% higher than current peaks of 10-12 micrograms/liter over the next 10-15 years. (2) 1974 total phosphorus loading to the lake is estimated at 75,000 lbs/day, and total nitrogen at 1,043,000 lbs/day. (3) The phosphate detergent ban has resulted in a significant (5400 lbs/day) reduction in phosphorus concentration in the lower Niagara River. (Lynch-Wisconsin)
W78-11998

ELUTRIATOR/MICROCOSM SYSTEM PILOT MODEL AND TEST,
Naval Ocean Systems Center, Kailua, HI.
E. C. Evans III, and R. S. Henderson.
Available from the National Technical Information Service Springfield, Va 22161, as PB-272 472, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/3-77-093, August 1977. 40 p, 14 fig, 8 tab, 17 ref, 1 append. IAG D6-F941.

Descriptors: *On-site data collections, *Prototype tests, *Bottom sediments, *Benthic fauna, *Kaneohe Bay(HI), *Nutrients, *Methodology, Hawaii, Sediments, Diverson, Sewage disposal, Estuaries, Estuarine environment, Bays, Water pollution control, Environmental effects, Sediment-water interfaces, Nutrient flux, Elutriation, Heavy metals, Biological communities, Ecosystems.

Laboratory procedures were developed for transferring sediments and resident faunal communities from Kaneohe Bay, Hawaii, to a prototype testing facility consisting of buckets or trays placed in large flow-through tanks of seawater. The experimental facility, or 'elutriator/microcosm,' was developed to obtain accurate information on nutrient exchange rates and on the influence of biological activity on these rates. Sewage discharges into Kanoehe Bay are scheduled for diverson to a deep offshore location in August 1977, and the new experimental system will be used to monitor changes in the benthic ecosystem. Two bucket-scoop collection methods for sediment transfer were sucessfully tested: (1) with buckets placed directly in the testing tanks; and (2) scooping followed by transfer of contents to polyethylene trays for placement in the tanks. The second method was preferable. Capture efficiency was high, as measured by number of alpheid shrimp(Alpheus machkayi) in field observations vs those in samples. Transferred communities were maintained over 90 days. Burrowing by the shrimp increased sediment surface area two or three-fold. Fauna increased about 10-fold during the 92 to 135-day test periods. Sediments did not cause observable changes in nutrient concentratons in the flow-through waters, suggesting that nutrient-rich sediments can act as an analogue to an artificial reef. (Lynch-Wisconsin)
W78-12000

TROPHIC EQUILIBRIUM OF LAKE WASHINGTON,
Washington Univ., Seattle. Dept. of Zoology.
W. T. Edmondson.
Available from the National Technical Information Service Springfield VA 22161, as PB-273 106 Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/3-77-087, August 1977. 35 p, 3 fig, 3 tab, 25 ref. R 8020 82-03-1.

Descriptors: *Lake Washington, *Trophic level, *Equilibrium, *Lake restoration, *Phosphorus, *Nutrients, *Water pollution control, Water chemistry, Lakes, Eutrophication, Washington, Diverson, Sewage disposal, Phytoplankton, Algae, Chlorophyll, Transparency, Zooplankton, Primary productivity.

The process of recovery of Lake Washington (Washington State) following diversion of sewage effluent in 1963-68 is described, and results of a post-recovery study in 1973-76 are presented. Nutrient enrichment began in 1941, and in 1958 a public vote requires diversion of the sewage. With initial diversion of one-third of the effluent beginning 1963, water quality in the lake ceased deteriorating, and with further diversion began to recover as measured by increasing transparency and decreasing phytoplankton abundance. By 1972 the lake appeared to coming into equilibrium. Detailed limnological studies were made during part of the lake's deterioration and all of its recovery. This paper presents data for 1973-76, with comparative data for 1933 and 1950, when water quality was acceptable, and from 1963 when response to eutrophication was maximal. A major change is taking place in zooplankton composition, with the disappearance of Oscillatoria and the reappearance of Daphnia after an absence of over 23 year. As this event is probably not directly related to trophic recovery, it appears that the lake is entering a new phase. Following diversion, total phosphorus decreased rapidly until it largely stabilized in 1971 at 17 micrograms/liter, with a slight decreasing trend. The lake has retained about 56% of the phosphorus entering in 1971-75. Phytoplankton has decreased faster than phosphorus during 1971-76. A major increase in transparency occurred in 1976. (Lynch-Wisconsin)
W78-12001

DISTRIBUTION OF PHYTOPLANKTON IN WEST VIRGINIA LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
V. W. Lambou, F. A. Morris, M. K. Morris, L. R. Williams, and W. D. Taylor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 515, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/3-77-103, September 1977. 21 p, 3 tab, 11 ref, 1 append.

Descriptors: *West Virginia, *Lakes, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Impoundments, *Bioindicators, *National Eutrophication Survey, Algae, Reservoirs, Distribution, Species diversity, Diversity indices, Species composition, Floral lists, Data collections, Bluestone Reservoir(WV), Lake Lynn Reservoir(WV), Summersville Reservoir(WV), Tygart Reservoir(WV).

Phytoplankton species composition and abundance were determined for four West Virginia reservoirs; trophic status was also assessed by means of several waste quality indices, including Nygaard's five trophic state indices, Palmer's organic pollution indices, the Brillouin and Shannon/Weaver species diversity indices, and abundance indices. The study was condicted in spring, summer, and fall 1973 as part of the National Eutrophication Survey. Impoundments were selected on the basis of actual or potential accelerated eutrophication problems as measured by three criteria: (1) contamination by sewage treatment plant effluent, (2) surface area of at least 40 ha, and (3) hydraulic retention time of at least 30 days. Lakes syrveyed were Bluestone Reservoir, Lake Lynn Reservoir(Cheat Lake), Summersville Reservoir, and Tygart Reservoir. Data are summarized by reservoir in an appendix contaning alphabetical lists of phytoplankton species with concentrations of each by sampling date, and results of application of the indices. Nygaard's indices are based on algal groups known to be unique to eutrophic or oligotrophic waters. The Palmer indices, designed for water samples with 20 genera, the other with 20 species. (Lynch-Wisconsin)
W78-12002

THE TROPHIC STATUS AND PHOSPHORUS LOADINGS OF LAKE CHAMPLAIN,
Vermont Univ., Burlington.
E. B. Henson, and G. K. Gruendling.
Available from the National Technical Information Service, Springfield, VA, 22161 as PB-273 502, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-600/3-77-106, September 1977. 141 p, 18 fig, 29 tab, 80 ref, 5 ref. CC6991931-J CC6991932-J.

Descriptors: *Lake Champlain, *Trophic level, *Phosphorus, *Eutrophication, *Waterpollution control, *Nutrient, Water pollution effects, Water management, Lakes, New York, Water chemistry, Algae, Phytoplankton, Cyanophyta, Zooplankton, Point pollution, Nonpoint pollution, Limnology, Cladophora, Vollenweider models, Model studies, Phosphates.

The phosphorus loading and budget, trophic status, and limnology of the Lake Champlain basin in New York and Vermont indicated deterioration of the lake's water quality. Symptoms of eutrophication include increases in Cladophora and aquatic weed growth, bacterial contamination, turbidity, toxins, cyanophytes, and mesotrophic-eutrophic diatom species. Secci disc readings have declined in the past decade, as have dissolved oxygen concentrations in the epilimion in early summer. Phosphorus loadings for each of 12 regions of the phosphorus-controlled lake are given. Total phosphate-phosphorus loading is calculated at 748 metric tons/yr, 90% of which is derived from surface drainage and 5% from direct waste treatment plant discharges. Only about 20% of the loading is discharged from the lake's outlet, indicating that some 600 metric tons are retaned each year. Vollenwieder's 1976 model was applied to each region. For the lake as a whole the critical phosphorus concentration (P)c amounted to 31.5 micrograms/liter, indicating very high phosphorus loading. Only four of the 12 regions were below the eutrophic level of (P)c-20 micrograms/liter. For the lake as a whole phosphorus loading would have to be reduced by 68% to achieve a (P)10 level (oligotrophic), 53% to (P)15 (mesotrophic), and 37% to the base of the eutrophic level. An inventory is given of point pollution sources, which account for 42% of phosphorus loading to the lake. (Lynch-Wisconsin)
W78-12003

STANDING CROP OF BENTHIC INVERTEBRATES OF LAKE WINGRA AND LAKE MENDOTA, WISCONSIN,
Wisconsin Univ.-Madison.
F. M. El-Shamy.
In: Transactions of the Wisconsin Academy of Sciences, Arts and Letters, Vol. 65, 1977, p 217-224. 1 fig, 12 ref.

Descriptors: *Lake Wingra(WI), *Lake Mendota(WI), *Benthic fauna, *Invertebrates, *Sunfishes, *Eutrophication, Insects, Wisconsin, Madison(WI), Lakes, Standing crop, Biomass, Abundance, Hyalella, Chironomids, Larvae, Mayflies, Fish, Species composition, Feeding rates.

A study of benthic invertebrates in Lakes Wingra and Mendota, Madison, Wisconsin June-August 1972 showed that decline in benthic invertebrates in Lake Wingra has significantly affected fish population dynamics in the lake. Bottom organisms were highly diversified and more abundant in Lake Mendota than in Lake Wingra, with maximum differences in early summer and least differences in August. Stomach analyses of bluegills in the two lakes reveal the importance of macroinvertebrates in the diet of the fish. However, Lake Wingra bluegills also depend on planktonic organisms throughout the growing season, and small and large fish feed on particles of similar size. In contrast, Lake Mendota bluegills prey almost exclusively on benthic macroinvertebrates, and there is a definite correlation between food particle size and fish size. Not only is more energy expended in catching the tiny plankton, but the microscopic animals have more indigestible material per unit of body weight than larger organisms. Extensive studies have confirmed that Lake Mendota bluegills grow faster and consume more food than those of Lake Wingra. Benthic invertebrates caught from Lake Wingra were mainly chironomid larvae, with

some water mites and mayfly nymphs. Hyalella was absent, and damsel flies and caddis flies rare. In Lake Mendota Hyalella was abundant, while damsel flies, caddis flies, and stone flies were found only occasionally. (Lynch-Wisconsin)
W78-12004

CHANGES IN SUBMERGED MACROPHYTES IN GREEN LAKE, WISCONSIN FROM 1921 TO 1971,
M. J. Bumby.
In: Transactions of the Wisconsin Academy of Sciences, Arts and Letters, Vol. 65, p 120-151. 9 fig, 1 tab, 34 ref. (1977).

Descriptors: *Submerged plants, *Macrophytes, *Green Lake(WI), *Myriophyllum spicatum, *Eutrophication, *Water quality, Wisconsin, Lakes, Potamogeton, Najas flexilis, Vallisneria americana, Chara, Cladophora, Microcystis aeruginosa, Anabaena flos-aquae, Aphanazomenon flos-aquae, Gloeotrichia echinulata, Phytoplankton, Filamentous algae, Algae, Zooplankton, Littoral.

Changes in 1971 of a 1921 survey of aquatic plants at 30 selected stations in Green Lake, Wisconsin, showed an overall decrease in total biomass. Three depth zones were sampled: zone one, 0-1 m; zone two, 1-3 m; and zone three, 3-10 m. Five species increased in biomass: Myriophyllum spicatum (the most abundant species and the one with the largest increase in biomass), Vallisneria americana, Najas flexilis, Potamogeton crispus, and Ranunculus longirostris. Eight species decreased: P. richardsonii, Heteranthera dubia, P. zosteriformis, Elodea canadensis, P. pectinatus, Zannichellia palustris, Ceratophyllum demersum, and Chara sp. Four species of Potamogeton were not found in the 1971 quadrats; however, all but P. foliosus were found elsewhere in the lake. Chara sp. had the greatest decrease (over 600 gm/sq m). The greatest decrease in total biomass occurred in the deepest part of littoral zone three, followed by the decreases in zone two and zone one. All stations with the highest biomass in 1921 decreased, while the low 1921 stations showed no consistent pattern of change. In 1971 biomass of the filamentous algae, mainly Cladophora sp., constituted a serious nuisance in the littoral zone, and was the most important autotroph by weight in zone one, and third in zones two and three. No Cladophora problem existed in 1921. Cyanophyta among phytoplankton in 1971 were Microcystis aeruginosa, Anabaena flos-aquae, Aphanazomenon flos-aquae, and Gloeotrichia echinulata. (Lynch-Wisconsin)
W78-12006

PHOTOSYNTHESIS OF THE SUBMERGENT MACROPHYTE CERATOPHYLLUM DEMERSUM IN LAKE WINGRA,
Istituto Italiano di Idrobiologia, Pallanza (Italy).
P. Guilizzoni.
In: Transactions of the Wisconsin Academy of Sciences, Arts and Letters, Vol. 65, 1977, p 152-162. 5 fig, 20 ref. NSF BMS75-19777.

Descriptors: *Ceratophyllum demersum, *Macrophytes, *Lake Wingra(WI), *Submerged plants, *Photosynthesis, *Eutrophication, Myriophyllum spicatum, Lakes, Wisconsin, Madison(WI), Carbon radioisotopes, Primary productivity, Depth, Light intensity, Light penetration, Age, Leaf-stem ratio, Littoral.

Photosynthetic rate measurement of shoot sections of the submerged aquatic macrophyte Ceratophyllum demersum in eutrophic Lake Wingra (Madison, Wisconsin) showed that declining primary productivity correlated with diminishing irradiance at lower depths, increasing tissue age, and reduction in the leaf/stem ratio. A carbon-14 method was used in the measurements. The saturated photosynthetic rate of 2.3 mg C/g (dry wt)/hr for C. demersum was attained at 650-700 microE/sq m/sec at a water temperature of 21C. In Lake Wingra, a small alkaline lake, C demersum grows in scattered patches anchored in the soft sediment within the Myriophyllum spicatum community which dominates the littoral zone. Comparison of the two species indicates that C. demersum may be characterized as a species adapted to low light intensity, and C. demersum plants showed a much more rapid reduction of carbon-14 uptake from growing tips to the bottom. Field experiments were designed to study photosynthesis of C. demersum within the M. spicatum community, while laboratory tests were directed at determining the photosynthetic profile of C. demersum exposed to constant light and a water temperature of 25C. Specimens were collected in August-September 1975; details of the experiments are given. (Lynch-Wisconsin)
W78-12007

PROGRAM AND ABSTRACTS: SYMPOSIUM ON NONBIOLOGICAL TRANSPORT AND TRANSFORMATION OF POLLUTANTS ON LAND AND IN WATER.
National Bureau of Standards, Washington, DC.
For primary bibliographic entry see Field 5B.
W78-12015

THE PHOTOCHEMISTRY OF XENOBIOTICS,
California Univ., Davis.
For primary bibliographic entry see Field 5B.
W78-12017

REACTION RATES OF ELECTRON PAIR DONOR MOLECULES WITH POLLUTANTS IN WATER,
Brown Univ., Providence, RI. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-12020

ADSORPTION AND TRANSPORT OF POLLUTANTS ON SUSPENDED PARTICLES,
Bedford Inst. of Oceanography Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5B.
W78-12022

PREDICTIVE MODELING OF THE BEHAVIOR OF POLLUTANTS IN THE AQUATIC ENVIRONMENT,
Environmental Research Lab., Athens, GA.
For primary bibliographic entry see Field 5B.
W78-12024

PREDICTION OF SOLUBILIZATION OF HYDROPHOBIC ORGANIC COMPOUNDS IN WATER,
Pomona Coll., Claremont, CA.
For primary bibliographic entry see Field 5B.
W78-12025

THE ENVIRONMENTAL PHOTODEGRADATION OF SELECTED ORGANOMETALIC COMPLEXES,
Eastman Kodak Co., Rochester, NY. Health, Safety and Human Factors Lab.
H. B. Lockhart, Jr.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May, 1976, p. 110-113. 4 fig, 10 ref.

Descriptors: Pollutants, Path of pollutants, Metals, *Manganese, *Iron, *Cobalt, Environmental effects, Light, Light intensity, Chemical reactions, *Chelation, Hydrogen ion concentration, *Aquatic environment, Laboratory studies, methodology, *Photolysis, *EDTA, *Chelating agents, Organometallic complexes, Sunlight, EDTA chelates, Photodegradation.

Synthetic chelating agents, such as EDTA, are used in our society. These chelating agents reach the aqueous environment via the discharge of wastes. Due to the concentrations of common metal ions in natural waters and the formation constants for the complexes formed between chelating agents and these metal ions, any study of the environmental fate of chelating agents must be, in fact, a study of these complexes. (See also W78-12015) (EIS-Katz)
W78-12026

KINETICS OF HYDROLYSIS AND OXIDATION OF ORGANIC POLLUTANTS IN THE AQUATIC ENVIRONMENT,
Stanford Research Inst., Menlo Park, CA.
W. R. Mabey, and T. Mill.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p. 114-121. 3 tab, 12 ref.

Descriptors: Pollutants, Path of pollutants, *Degradation(Decomposition), *Organic wastes, Chemical properties, Chemical reactions, Chemical wastes, Hydrogen ion concentration, Aquatic environment, Water temperature, *Oils, *Hydrolysis, *Free Radical oxidation, Alkoxy radicals, Olefins, *Organic halides, Epoxides.

Oxidation and free radicals oxidation can be important degradation pathways for some organic pollutants in aquatic environments. Knowledge of the theoretical and experimental features of these reactions can be meaningfully applied to prediction of degradation rates and to design of experiments that are relevant to environmental conditions. Three general hydrolysis mechanisms can be described. Depending on the compound, the hydrolysis kinetics may be acid and/or base catalyzed as well as being pH independent in a neutral reaction with water. The observed rate of hydrolysis may be due to any one or a combination of these mechanisms and will be determined by the pH and the temperature of the aquatic environment. (See also W78-12015) (EIS-Katz)
W78-12027

PREDICTION OF VOLATILIZATION RATE OF POLLUTANTS IN AQUEOUS SYSTEMS,
Toronto Univ. (Ontario). Dept. of Chemical Engineering and Applied Chemistry.
D. Mackay, and Y. Cohen.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p. 122-129. 3 fig, 11 ref.

Descriptors: Pollutants, Aquatic environment, *Volatility, Water quality, Waste treatment, *Dissolved solids, Particulates, *Physical properties, *Physico-chemical properties, Water particulate surfaces, *Volatilization rates, Aqueous system, *Pollutant volatilization, Surface microlayers, *Evaporating pollutant, Henry's Law.

In predicting the rate of volatilization of pollutants from aqueous environments the Whitman two film resistance approach is used, yielding a mass flux equation in which the three major parameters are the Henry's Law constant and the gas and liquid phase mass transfer coefficients. These three parameters are discussed in terms of the availability of data representation of environmental conditions, methods of obtaining such data experimentally or theoretically with emphasis on areas of inadequacy. Finally, some complications introduced by surface organic microlayers and the presence of interfering dissolved or particulate materials are outlined. It is concluded that the major areas of uncertainty are the value of the liquid phase mass transfer coefficient and the effects of other dissolved materials in modifying the Henry's Law constant of and evaporating pollutant. (See also W78-12015) (EIS-Katz)
W78-12028

ENVIRONMENTAL PHYSICS AND CHEMISTRY OF AQUATIC POLLUTANTS,
Harvard Univ., Cambridge, MA. Div. of Engineering and Applied Physics.
For primary bibliographic entry see Field 5B.
W78-12030

OXIDATION AND REDUCTION OF PESTICIDES IN SOILS AND SEDIMENTS,
Department of Agriculture Beltsville, MD.
J. R. Plimmer.
In: Symposium on Nonbiological Transport and Transformation of Pollutants on Land and Water, May 1976, p. 152-156.

Descriptors: *Pesticides, *Soils, *Sediments, Oxidation, Reduction potential, Aquatic environment, *Degradation(Decomposition), Chemical reactions, Oxygen, Anaerobic conditions, Organic loading.

Several mechanisms may be involved in the transformation of pesticides in soils and aquatic systems. Of these, transformation by microorganisms is predominant, but may purely chemical reactions may accompany biological pathways. The distinction between chemical and biological transformations in soils presents many experimental problems. Reactive intermediates may be generated in metabolic processes or arise by the action of free radiclas in soil. Some chemical systems may be used as models to provide useful insights into the nature of the processes involved. Reactions occuring in sediments depend on the the availability of oxygen. Anaerobic processes will be favored as oxygen is depleted in sediments rich in organic nutrients. Measurement of redox potential may be a useful guide to potential reaction pathways. (See also W78-12015) (EIS-Katz)
W78-12032

AQUATIC HABITAT OF COAL AND BENTONITE CLAY STRIP MINE PONDS IN THE NORTHERN GREAT PLAINS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
For primary bibliographic entry see Field 2H.
W78-12038

DISEASE HAZARD OF PATHOGENIC ORGANISMS IN FARM WASTE MATERIAL,
Agricultural Research Council, Compton (England). Inst. for Research on Animal Diseases.
For primary bibliographic entry see Field 5G.
W78-12072

THE IMPACT OF SUBTIDAL SEWAGE OUTFALLS ON THE INTERTIDAL MACROFAUNA OF SEVERAL CENTRAL PUGET SOUND BEACHES,
Washington Univ., Seattle.
For primary bibliographic entry see Field 2L.
W78-12095

METHODS FOR MEASURING THE ACUTE TOXICITY OF EFFLUENTS TO AQUATIC ORGANISMS,
Environmental Research Lab., Athens, GA.
For primary bibliographic entry see Field 5A.
W78-12099

DISTRIBUTION OF PHYTOPLANKTON IN MARYLAND LAKES,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
V. W. Lambou, F. A. Morris, R. W. Thomas, M. K. Morris, and L. R. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 940, Price codes: A04 in paper copy, A01 in microfiche. Publication No EPA-600/3-77-124, October 1977. 24 p, 3 tab, 11 ref, 1 append.

Descriptors: *Maryland, *Lakes, *Phytoplankton, *Trophic level, *Eutrophication, *Water quality indices, *Impoundments, *Reservoirs, Bioindicators, Algae, Distribution, Species diversity, Diversity indices, Species composition, Floral lists, Data collections, National Eutrophication Survey, Deep Creek Lake(MD), Liberty Reservoir(MD), Loch Raven Reservoir(MD), Johnson Pond(MD).

Phytoplankton species composition and abundance were determined for four Maryland lakes and reservoirs; in addition, trophic status was assessed by means of several water quality indices, including Nygaard's five trophic state indices, Palmer's organic pollution indices, the Brillouin and Shannon/Weaver species diversity indices, and abundance indices. The study was conducted in spring, summer, and fall 1973 as part of the National Eutrophication Survey. Lakes were selected on the basis of actual or potential accelerated eutrophication problems as measured by three criteria: (1) contamination by sewage treatment plant effluent, (2) surface area of at least 40 ha, and (3) hydraulic retention time of at least 30 days. Lakes surveyed were Deep Creek Lake, Liberty Reservoir, Loch Raven Reservoir, and Johnson Pond. Data are summarized by lake in an appendix containing alphabetical lists of phytoplankton species with concentrations of each by sampling date, and results of application of the indices. Nygaard's indices are based on algal groups known to be unique to eutrophic or oligotrophic waters. Palmer indices incorporate two lists of organic pollution-tolerant taxa, one with 20 genera, and one with 20 species. (Lynch-Wisconsin)
W78-12100

5D. Waste Treatment Processes

WATER POLLUTION CONTROL IN METAL FINISHING INDUSTRY,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
C. P. C. Poon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 089, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, (1978). 13 p, 1 fig, 2 tab, 1 ref. OWRT A-062-RI(1).

Descriptors: *Metal finishing waste water, Copper, Nickel, Zinc, Cadmium, Chromium, Cyanide, Electrochemical reaction, Electroflotation, Seawater, Performance model, Cost, Industrial wastes, Waste water treatment, Coagulation, Chlorination.

A unique electrochemical reactor was used for batch treatment of metal finishing waste water. Using low DC currents, waste water containing copper, nickel or zinc, or cadmium with cyanide, and chromium could be removed successfully to meet the federal effluent quality standards. Electro-coagulation and flotation as well as chlorination were responsible for all the reactions required in the removal processes. Sacrificing iron anode was used for the chromium removal processes while a plantinated anode was used for others. Performance models and a cost analysis were presented. Use of lower electric currents often resulted in a higher metal removal potential expressed as mg metal removal per kwh power consumption.
W78-11380

THE RELIABILITY OF SAND DEWATERING BEDS FOR SLUDGE MEASURED BY THE PERFORMANCE INDEX,
Clark (Edward E.), Miami, FL.
K-m. Lo, and D. D. Adrian.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 925-941, 1978. 6 fig, 3 tab, 7 ref.

Descriptors: *Dewatering, *Reliability, *Design, *Methodology, *Sand beds, *Sludge, Computer models, Economics, Climatic data, Weather, Effects, Simulation analysis, Systems analysis, Equations, Uncertainty, Cost minimization, Marginal analysis.

This study relates to the development of a methodology to aid an engineer design sand beds for sludge drainage and drying based on the nature of the sludge, climatic conditions, and economic factors. Computer simulation proved useful in studying the uncertainty introduced by weather effects on the performance of sand dewatering beds. Computer simulation also brought about a union of engineering and economic analysis. The methodology involves the following steps: (1) formulation of a mathematical model for sludge drainage and drying on sand beds; (2) preparation of input data; (3) validation of the simulation experiments; and (4) analysis of the simulaton outputs to attain an optimum system design. Simulation of sludge dewatering for 20 year periods for weather conditions typical of various cities of the United States produced a random variable, the required dewatering time, and its frequency distribution. The frequency distribution was affected by weather conditions. The sludge solids content usually dominated the effects of specific resistance in affecting the dewatering time. Two different economic analyses were used: selecting the alternative that would fulfill the target output at minimum cost and marginal analysis. (See also W78-11386) (Bell-Cornell)
W78-11415

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN: SUMMARY REPORT.
Army Engineers District, Chicago, IL.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A036 641, Price codes: A08 in paper copy, A01 in microfiche. April 1974, 16 sections, 17 tab, 18 fig, 1 annex. Appendices A-I published as separate volumes.

Descriptors: Waste water(Pollution), *Waste water treatment, *Lake Michigan, *Planning, *Management, Waste water disposal, Environmental effects, Illinois, Indiana, Topography, Population, Land use, Economics, Engineering, Design, Alternative planning, Resources, Storm water, Institutions, Local governments, State government, Sludge disposal, Land treatment, Social aspects, Economic impact, Water pollution, *Illinois River, *Waste water management, Water quality management, Chicago(IL).

The study's purpose is twofold: to identify and evaluate waste water treatment systems that might eliminate pollutant discharges into the study area's lakes and streams; and to incorporate these evaluations into relevant plans. The objective is to use these accomplishments to provide a framework for decision. This summary report is a review of a planning study intended to assist the states and local agencies in Northeastern Illinois and Northwestern Indiana which are responsible for planning for responsible waste water management. For long-term planning, the projected needs for the year 2020 were used; however, final design was based on the more immediate requirements of 1990. Reviewed in this summary document are background information, design considerations, development and selection of alternatives, final alternative plans, the evaluation framework, resource implications, socio-environmental impacts, institutional assessment, economic assessments, impact perspective and views of local interest. General conclusions of the study are presented: any of the five final alternatives would improve the quality of Lake Michigan and the Illinois River as well as tributary streams in the areas; existing waste water management plans are inadequate; all alternatives have flexible time schedules; industrial options include total or par-

tial on-site treatment; recreational potentials, property values, and water supply quantities in the study area would be greatly enhanced by treatment to suggested water quality levels; and no single alternative is clearly best from all perspectives. Specific conclusions are also presented for storm water management, resource requirements, regionalization and sludge management. (See W78-11476 thru W78-114831) (Zayac-NC)
W78-11475

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN--APPENDIX A: BACKGROUND INFORMATON.
Army Engineers District, Chicago, IL.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A036 642, Price codes: A09 in paper copy, A01 in microfiche. July 1973, 7 sections, Bibliography, 30 tab, 24 fig, Summary Report and Appendices B-I published as separate volumes.

Descriptors: *Lake Michigan, *Planning, *Flood control, *Water supply, *Water quality, *Land use, Indiana, Illinois, Geology, Topography, Drainage, Climatology, Industrial wastes, Municipal wastes, Hydrologic systems, Water pollution, Pollution abatement, Land treatment, Recreation facilities, Wildlife conservation, Wildlife management, Navigation, Electric power, Bottom sediments, Institutions, Governments, *Waste water management, *Illinois River, Inventory, Open space, Pollutant loadings, Objectives, Chicago(IL).

This appendix is a compendium of background information for the study area. First inventoried is land, climatological and biological conditions. Land use is then discussed, including present and projected land use patterns for the study area. These data are then used as the basis for population and industrial flow projections. Water management needs are discussed in terms of flood control, minimum hydrologic flows, water supply and quality, open space, recreational development, wildlife restoration and conservation, navigation and electric power. Reaches are then listed in terms of their peculiar hydrologic regimes, including bottom deposits, critical loadings and ultimate quality goals. Planning objectives are reviewed as defined by earlier studies, by regional commissions and by potential land treatment areas per county. Restrictions for water management--including those restrictions on the use of Lake Michigan waters, by government structure and by fragmentation of management action--are then listed. Finally, current and planned water management activities are inventoried. These include current abatement operations, regional plans, water supply alocations, open space planning, flood control, fish and wildlife enhancement, navigation and electric power generation. (See also W78-11475) (Zayac-NC)
W78-11476

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MANAGEMENT-APPENDIX B: BASIS OF DESIGN AND COST AND DATA ANNEX APPENDIX B: BASIS OF DESIGN AND COST.
Army Engineers District, Chicago, IL.
Available from the National Technical Information Service, Springfield, VA as AD-A036 643, Price codes: A00 in paper copy, A01 in microfiche, AD-A036 644, Price codes: A10 in paper copy, A01 in microfiche. Appendix: July 1973, 7 sections, 102 fig, 76 tab, Data Annex: May 1973, 7 sections, 20 fig, 22 tab. Summary Report and Appendices C-I published as separate volumes.

Descriptors: *Lake Michigan, *Cost analysis, *Design standards, *Management, *Water quality, *Planning, Illinois, Indiana, Cost comparison, Resources, Environmental effects, Design criteria, Regional analysis, Industries, Conveyance structures, Soil management, Non-structural alternatives, Water reuse, Waste water treatment, Impacts, Water pollution, Land treatment, Sludge disposal, *Illinois River, Management systems, *Design comparisions, *Water water management, Data Annex, Industrial treatment, Synergism, Chicago(IL).

This appendix contains the criteria and rationale used to design and cost the final five waste water management alternatives presented in the Summary Report and detailed in Appendix D. This appendix is divided into two parts and bound separately--a formal volume and a Data annex. The Data Annex presents more detailed, supporting information pertinent to the formal presentation and is structured parallel to that volume. Design summaries are first presented for each of nine systems--regional treatment, industrial treatment, sludge management, storm water management, conveyance, rock and residual soil management, reuse, synergism and non-structural management systems. The flow bases of design are discussed next. Present domestic-commercial and industrial flows are used to develop projected flows; and present stormwater flows are used to project future stormwater flows. These projected total flows are then summarized. Each of the component bases of design are inventoried according to the above mentioned system, followed by a cost estimation methodology. This methodology is then applied to the nine systems. Finally, impacts of each system are assayed, including impacts of resources and system performance. (See also W78-11475) (Zayac-NC)
W78-11477

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN--APPENDIX C: PLAN FORMULATION.
Army Engineers District, Chicago, IL.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A036 645, Price codes: A08 in paper copy, A01 in microfiche. July 1973, 9 sections, 19 tab, 47 fig. Summary Report and Appendices A, B and D-I published as separate volumes.

Descriptors: *Lake Michigan, *Planning, *Analysis, *Evaluation, *Water quality, *Waste water treatment, Indiana, Illinois, Institutions, Environmental effects, Social aspects, Cost analysis, Cost comparisons, Resources, Pollutants, Storm water, Water reuse, Conservation, Water pollution, Land treatment, Sludge disposal, *Illinois River, *Waste water management, *Guidelines, *Water quality management, Concepts, Procedures, System design, Public involvement, Chicago(IL).

This appendix presents the planning concepts and procedures used in developing the five waste water management alternatives proposed in the study. This appendix in particular documents the study's objectives and strategies including: the plan-formulation process; the establishment of the basis of system design; and the evaluation of proposed alternatives. Each alternative is structured to meet the study area's long-term needs for 2020; however, final design is based on the requirements of 1990. After presenting background information, the appendix turns toward the study goals for water quality standards, pollutant sources, storm water runoff, and water reuse and conservation. A planning overview--including socio-environmental studies, institutional studies and public involvement--is then presented. The initial stage for plan formulation considers strategy and alternative selection criteria; it then suggests a first state planning perspective. An intermediate stage of plan formulation then develops costing comparisons of the initial stage's alternatives. More intermediate alternatives are then developed and new modifications to design criteria are identified. A framework for assessment is next developed and used to study resource consumption and impacts to areal resources, cost, institutions, and the socio-environmental area. the final stage of plan formulation begins by developing guidelines for final screening, and then uses these criteria to look at the five proposed alternatives. Design modifications are then suggested, followed by a summary and plans for public involvement. (See also W78-11475) (Zayac-NC)
W78-11478

WASTEWATER MANAGEMENT STUDY CHICAGO SOUTH END OF LAKE MICHIGAN--APPENDIX D: DESCRIPTION AND COST OF ALTERNATIVES.
Army Engineers District, Chicago, IL.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A036 646, Price codes: A13 in paper copy, A01 in microfiche. July 1973, 7 sections, 54 tab, 34 fig. Summary Report and Appendices A-C, E-I published as separate volumes.

Descriptors: *Lake Michigan, *Waste water(Pollution), *Management, *Planning, *Waste water treatment, Indiana, Illinois, Urbanization, Suburban areas, Alternative costs, Alternative planning, Regional analysis, Economics, Model studies, Methodology, Construction cost, Flow characteristics, Land treatment, Sludge disposal, Storm water, *Illinois River, *Waste water management, Chicago(IL).

This appendix describes cost and analyzes construction phasing for each of the final five regional waste water management plans presented in the Summary Report and selected in Appendix B. A brief sketch of the five alternatives follows. Alternative I is a reference plan designed to meet current stream quality standards as identified by Illinois and Indiana; Alternative II proposes physical-chemical treatment technologies to meet the no-discharge of critical pollutants (NDCP) water quality goals; Alternative III provides for advanced biological technologies to meet NDCP goals; and Alternative V proposes using advanced biological treatment technologies in the urbanized areas and land treatment techniques in the outer, suburban areas to meet NDCP goals. The alternatives are first described in detail. Next, a phasing and implementatin schedule for each alternative is considered. Using unit costs developed in Appendix B, management systems costs are Aggregated for each alternative over the implementation schedule; present worth and annual average charges are then presented. The regional waste water management alternatives are then compared using both cost comparisons and comparisons of the stream flow regime impacts. These five current alternatives are then compared with previous alternatives developed in a 1972 study. Finally, recommendations are made for future pilot projects. (See also W78-11475) (Zayac-NC)
W78-11479

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN--APPENDIX E: SOCIAL-ENVIRONMENTAL EVALUATION.
Corps of Engineers, Chicago, IL. Chicago District.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 647, Price codes: A05 in paper copy, A01 in microfiche. July 1973, 2 annex, 5 sections, 44 tab, 10 fig. Summary Report and Appendices A-D, F-I published as separate volumes.

Descriptors: *Social aspects, *Environmental effects, *Lake Michigan, *Waste water treatment, *Social impacts, *Water quality, Indiana, Illinois, Alternative planning, Aesthetics, Soils, Air quality, Resources, Management, *Illinois River, *Waste water management, Human values, Quality-of-life, Subjective indicators, Objective indicators, Matrices, Chicago(IL).

This appendix assesses the social and environmental impacts likely to arise from the implementation of the five waste water management alternatives

presented in the Summary Report and detailed in Appendix D. These evaluations were done by using Alternative I--the reference alternative--and subjectively assessing the effects of the four other alternatives to it. This appendix is based on an analysis of the processes by which the proposed alternatives might affect both the environment and the quality of life. Four sets of impact parameters are assayed: system components, their construction and operation, as well as their expected performances; environmental resource attributes of the study area; man's social well-being as determined by his resource use activities; and the relative worth of human values and goals. Changes created in environmental conditions and resource use by waste water management activities are then studied to determine how these changes modify both human activities and the availability of these activities. A matrix was used to make subjective judgments as to how a major system component (e.g. conveyance, treatment process, distribution of treated effluent, sludge management) affected each major environmental element (e.g. water quality, air quality, soil, aesthetics, etc.) and subsequently human activities (recreation, land use, transportation, etc.). Advantages and disadvantages of this approach are discussed, the main points of which include this being an attempt to quantify the unquantifiable, and that impacts are expressed in terms of subjective assessments. (See also W78-11475) (Zayac-NC)
W78-11480

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MICHIGAN--APPENDIX G: VALUATION.
Corps of Engineers, Chicago, IL. Chicago District.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 649, Price codes: A11 in paper copy, A01 in microfiche. July 1973, 12 sections, 2 annex, 28 tab, 14 fig. Summary Report and Appendices A-F, H-I published as separate volumes.

Descriptors: *Lake Michigan, *Alternative planning, *Environmental effects, *Economic impact, *Water quality, *Planning, Indiana, Illinois, Implied benefits, Resource allocation, Resources, Resource mix, Social aspects, Cost comparisons, Institutions, Water reuse, Water pollution, Impacts, Waste water treatment, Conservation, Land treatment, *Illinois River, *Waste water management, Valuations, Implications, Use potential, Environmental goals, Chicago(IL), Socio-environmental impacts.

This appendix presents a broad evaluation of the implications and use potential inherent in each of the final five waste water management alternatives presented in the Summary Report and detailed in Appendix D. Its analysis evaluates the functional components of each proposed alternative. Components include collection facilities, treatment processes and sludge (residual) handling and management. Also included in the analysis of each alternative are its economic, water reuse, resource and local ramifications. An effort has been made to balance consumptive demands against socio-environmental goals. After an initial review of the study scope, area and value components of waste water management are studied. Included here are water quality goals, available technologies, pollutant sources, storm water runoff and reuse and conservation objectives. The process of alternative selection is reviewed by looking at strategy considerations and possible arrangements of above mentioned components. Resource implications are next studied; here a framework for assessment as applied to resource consumption and areal resource impact is presented. Following is an identification of socio-environmental considerations: labor requirements, social disruptions and socio-environmental impacts. Institutional and economic assessments are then presented. System-related changes--both in the study area and outlying areas--are analyzed in terms of water balance, flood control, stream usage, land use changes, rock and soil management, power generation and agri-business. Cost comparisons are also considered. (See also W78-11475) (Zayac-NC)
W78-11481

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MICHIGAN--APPENDIX H: PUBLIC INVOLVEMENT/PARTICIPATION PROGRAM.
Corps of Engineers, Chicago, IL. Chicago District.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 650, Price codes: A24 in paper copy, A01 in microfiche. July 1973, 5 sections. Summary Report and Appendices A-G and I published as separate volumes.

Descriptors: *Lake Michigan, *Planning, *Water quality, *Waste water treatment, Indiana, Illinois, Participating funds, Alternative planning, Interagency cooperation, Coordination, Communication, Programs, Management, Water supply, *Waste water management, *Illinois River, *Public participation, Citizens advisory committees, Interaction, Correspondence, Citizen involvement, Communications media, Public meetings, Chicago(IL).

This appendix documents both public involvement and participation in the C-SELM study. Procedures used by the Corps of Engineers are described, along with a general review of public meetings, contacts with citizen advisory groups, interagency coordination and the relationships with the various communications media. Feedback modes which the Corps used to encourage communication with the public are also described. A program overview first summarizes the effort. Included here is an historical perspective of public involvement and program objectives. The program structure is noted, including methods such as advisory committees, public meetings, governmental coordination, media coverage and special briefings. The program sequence is then described: Stage I-Initiation of Study; Stage II-Initial Alternatives; Stage III-Intermediate Alternatives; Stage IV-Selection of Final Alternatives; and Stage V-Agricultural Developments. The overview concludes with an analysis of the program's effectiveness. Stage I is divided into two parts: initial public meetings in Indiana and Illinois, including the Corps' presentation; and the results of the citizens advisory committee in local planning districts and sanitary districts. Stage II is highlighted by development and screening of an initial set of 19 alternatives and interactions with the public during that process. Stage III reviews the evaluation of the intermediate set of 11 alternatives selected from the initial set. Intermediate advisory committee meetings, technological issues, socio-environmental impact analysis methodology and questions raised by citizens are summarized. Stage IV reviews the interactions with the public in the final selection of alternatives and public meetings concerned with plan formulation. Stage V reviews agricultural development and presents various correspondence. (See also W78-11475) (Zayac-NC)
W78-11482

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MICHIGAN--APPENDIX I: COMMENTS.
Corps of Engineers, Chicago, IL. Chicago District.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 651, Price codes: A09 in paper copy, A01 in microfiche. January 1974, 5 sections. Summary Report and Appendices A-H published as separate volumes.

Descriptors: *Lake Michigan, *Participation, *Waste water treatment, *Water quality, *Planning, Illinois, Indiana, Local governments, State governments, Impacts, Land treatment, *Illinois River, *Waste water management, Values, *Public participation, Federal agencies, State agencies, Regional agencies, Local organizations.

This appendix contains all the formal comments from local, state and Federal entities resulting from their reviews of the C-SELM study's Summary Review and other appendices. Presented are the perspectives these entities, plus citizen groups and individuals, have of the alternative waste water treatment technologies, regional systems and planning options considered in the study. From the comments contained in this appendix, it is concluded that there is no single 'best' alternative: all alternatives have different benign and malign environmental, social and regional impacts to different individuals and concerns. The appendix has tried to take a neutral approach in its characterization of the range of impacts. But the comments contained in this appendix make it clear that the issues raised by the study have forged strong opinions on the part of organizations of citizens as voiced by opinions recorded at public meetings and through work groups. The comments indicate that a final decision cannot be made on narrowly defined technical or cost-effective bases. Rather, this appendix suggests that 'the final answer must be determined by the residents of both the study and outlying areas working with the states in determining a solution for all'. Thus, the appendix's purpose is to present an array of viewpoints so that the desirable and undesirable technical and economic issues can be balanced against a personal framework of desires and goals. (See also W78-11475) (Zayac-NC)
W78-11483

THREE-STEP TREATMENT FOR PIGGERY WASTES.
Ghent Rijksuniversiteit (Belgium). Dept. of General and Industrial Microbiology.
H. Vanstaen, J. P. Voets, and W. Verstraete.
Water Research, V. 10, No. 10, p 927-928, 1976. 1 fig., 2 tab., 5 ref.

Descriptors: *Aerobic treatment, Biochemical oxygen demand, Nitrification, Activated sludge, Physical properties, Chemical properties, *Waste water treatment, *Swine wastes, *Anaerobic treatment, Effluent quality.

This paper reports the results of a pilot study in which an alternative three-step method for the treatment of piggery wastes was investigated. In this three-step treatment, the first aerobic treatment transforms the soluble BOD to microbial biomass and causes partial nitrification. The second step acts as a septic tank. A large amount of the biomass is retained and considerable amounts of oxidized nitrogenous compounds are removed. The third tank provides conventional activated sludge treatment. During the experiments the manure from a sow house, in which the manure was diluted because of an unlimited drinking water supply, and a fattening pig house, in which the drinking water supply was limited for a few hours a day, was used. Two experiments were conducted, one using the diluted wastewater and the other using the more concentrated wastewater. In the first experiment using the diluted wastewater, about 70% of the treated volume of wastewater could be discarded as effluent while 30% had to be stored as surplus sludge. In the second experiment, the total amount of surplus sludge to be stored amounted to plus or mirus 50% of the initial volume. In both experiments, the effluents were of acceptable BOD, appearance and odor. The content of non-degradable organic matter, N and P made them unacceptable for discharge into oligotrophic waters, although the liquid effluent could be discharged into a farm holding pond. (Bates-East Central)
W78-11547

COLD-CLIMATE WATER/WASTEWATER TRANSPORTATION AND TREATMENT -- A BIBLIOGRAPHY,
Alaska Univ., College. Inst. of Water Resources.
T. Tilsworth, D. W. Smith, G. M. Zemansky, and S. R. Justice.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 258, Price codes: A07 in paper copy, A01 in microfiche. Report No. IWR-72, December 1977. 135 p. OWRT A-047-ALAS(1), 14-31-0001-5002.

Descriptors: *Water treatment, *Waste water treatment, *Alaska, Arctic, *Bibliographies, Technology, Treatment facilities, Transportation(Wastes), Cold regions.

This bibliography contains 1,400 citations, including published and unpublished papers, on cold climate water and wastewate transportation and treatment systems. Sources listed include state and federal agency files which contain information on systems in Alaskan communities and the Alyeska Pipeline Service Company camps. References to systems in other northern countries are also included. The objectives of this study were to identify causes of the failure of Alaskan water and wastewater treatment and transportation facilities and to seek methods for design improvements. Originally, the investigators contemplated an evaluation of systems performance in remote areas in relation to the original conception, planning, design, and construction. Because of the tremendous amount of literature examined, the evaluation was undertaken in a subsequent study, 'Alaska Wastewater Treatment Technology' (A-058-ALAS) by Ronald Johnson. (See W78-11575)
W78-11574

ALASKA WASTEWATER TREATMENT TECHNOLOGY,
Alaska Univ., College. Inst. of Water Resources.
R. A. Johnson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 235, Price codes: A09 in paper copy, A01 in microfiche. Completion Report No. IWR-86, January 1978. 185 p, 38 fig, 27 tab, 137 ref, 2 append. OWRT A-058-ALAS(1), 14-34-0001-7003.

Descriptors: Waste treatment, *Waste water treatment, Technology, *Treatment facilities, *Alaska, *Performance, *Operation costs, Activated sludge, Industrial waste treatment, Sewage treatment, Sludge treatment, Tertiary treatment, Aerobic treatment, Septic tanks, Sewage treatment plants, Waste stabilization ponds, Coagulation.

An assessment has been made of wastewater treatment technology in Alaska. Some of the larger municipalities such as Juneau and Fairbanks have biological treatment plants that are meeting secondary standards. By the middle of 1976, the pipeline camps and pump stations were averaging around 92% BOD5 removal using mainly a combination of biological and physical-chemical treatment. Most of the industries, including the pulp mills and seafood processors, and the largest municipality, Anchorage, utilize only primary treatment. The pulp mills, however, have recently agreed to install additional treatment capacity to be in compliance with PL 92-500. Wastewater treatment is virtually nonexistent at many remote villages. However, some progress is being made in upgrading sanitation facilities in some of the villages. The USPHS has installed around sixty sanitation systems with running water. The Alaska Department of Environmental Conservation is installing some physical-chemical and extended-aeration package plants as part of a Village Safe Water Program. Detailed operating dat are not available for all but a few of the largest treatment plants. But, there are sufficient data to verity that encapsulated plants can work well in cold climates. For individual homes or other small-scale users, the options are septic tanks, aerobic package plans, or composting toilets. A large portion of operating costs of both small or large treatment plants are related to sludge disposal. Care must be taken to ensure that disposal does not contaminate groundwater. One promising method of disinfection that deserve wider consideration in lime addition, which has been shown to be effective at low temperatures and is simpler to use than chlorine addition. Freezing should be considered as a means of dewatering sluge. (See also W10-11519).
W78-11575

A MASS BALANCE STUDY OF RECYCLING SECONDARY MUNICIPAL WASTEWATER ON ABANDONED FIELD ECOSYSTEMS,
Michigan State Univ., East Lansing. Dept. of Zoology.
T. M. Burton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 275, Price codes: A04 in paper copy, A01 in microfiche. Institute of Water Research, Michigan State University, East Lansing. Completion Report. July, 1978. 51 p, 15 fig, 16 tab, 13 ref. OWRT A-091-MICH(1), 14-31-0001-6023.

Descriptors: *Water reuse, *Irrigated land, *Municipal wastes, Sewage disposal, Nitrogen, Phosphorus, Leaching, Vegetation management, Nutrient budgets, *Recycling, *Oldfields, *Mass balances, *Michigan, *Land application.

An experiment on the management of a municipal wastewater land application system using abandoned fields was conducted in 1976 and 1977 on a 10-year old oldfield site on thirty-six 0.07 ha plots arranged within 6 experimental blocks. Irrigation levels of 0, 5, and 10 cm/week of secondary effluent were used. Harvest treatments included no harvest, one harvest in June, and two harvests in June and September. Mass balances were construced for phosphorus and nitrogen for all treatments. The oilfield was very effective at wastewater renovation at all harvest treatment throguh most of the growing season. Nitrate-N concentrations in soil water leaching past the 120 cm depth remained well below the 10 mg/l drinking water standard except during September and October on the unharvested plots. Phosphorus remainded at blackground levels on all plots at the 120 cm depth. Harvesting extended the irrigation season by promoting active plant uptake into October. Harvesting in June removed 77% and 52% of added N on the 5 and 10 cm/week areas; harvesting in June and September removed 94% and 83% of N added to the 5 and 10 cm/week plots, respectively. Harvesting removed significant amouns of P. Harvesting and irrigation affected the makeup of the plant community. The irrigated harvested plots were dominated by quack grass (Agropyron repens) while the unharvested, irrigated plots were dominated by goldernrod (Solidago sp.). Vegetation response and plant species interactions are discussed.
W78-11577

THE INDUSTRIAL WASTE STUDIES PROGRAM. SUMMARY REPORT ON THE AUTOMOBILE INDUSTRY.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-11629

FEDERAL GRANTS AWARDED FOR CONSTRUCTING WASTE TREATMENT FACILITIES WHICH BENEFIT INDUSTRIAL USERS.
Comptroller General of the United States, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-11633

ACUTE RESIDUAL TOXICITY OF SEVERAL WASTEWATER DISINFECTANTS TO AQUATIC LIFE,
Grand Valley State Colleges, Allendale, MI. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11654

STANDARD UNITS SOLVE SEWAGE TANK ACCESS PROBLEM.
For primary bibliographic entry see Field 8G.
W78-11677

HUGE LOADS FUND WORLD'S LARGEST SEWAGE WORKS.
For primary bibliographic entry see Field 5G.
W78-11756

FILTRATION MEDIA FOR SEWAGE APPLICATIONS.
Water Services, Vol 82, No 989, p 422, July, 1978.

Descriptors: *Dewatering, *Filters, *Sludge treatment, *Membranes, *Filtration, Diatomaceous earth, Activated carbon, Separation techniques, Porosity, Pores, Waste water treatment, Municipal wastes.

Webron Products Ltd. of Rossendale, Lancashire, England, has introduced the Hydron needle felt wet filtration fabric. The fabric, which is used as a cover on rotary drums, has been pretested in filter presses and rotary drum filtration plants for dewatering digested sewage sludges. Results of the testing indicate that the Hydron product has a high liquid throughput rate and a long working life; it is also capable of producing a high quality filtrate and high solids content sludge cake. Filter press investigations have demonstrated that needle felt media provide high flow rates through the pore structure, shorter batch cycle time, and easy release of the sludge cake. The Hydron fabric, which is suitable for use with diatomaceous earth and activated carbon, is available in filtration grades ranging from coarse for sewage sludge to fine for particulate removal and clarification. (Lisk-FIRL)
W78-11762

ADVANCED WASTEWATER TREATMENT PLANT GAINS CARBON REGENERATION FURNACE.
Consulting Engineer, Vol 42, No 7, p 40, July, 1978.

Descriptors: *Tertiary treatment, *Activated carbon, *Incineration, *Burning, *Drying, Equipment, Aeration, Steel, Oxidation, Treatment plants, Waste water treatment, Municipal wastes.

A 7-hearth activated carbon regeneration furnace has been installed in the Coleshill, England, advanced waste water treatment plant, under the jurisdiction of the Severn-Trent Water Authority. The furnace is constructed of a mild steel, 5 m-high stack lined with refractory blocks; a variable speed shaft drives a rotating nickel-chrome rabble arm unit in each 1.5 m diameter hearth to agitate the carbon as it falls through the hearth floor gratings. The carbon is dried by five burners and an electrical fan supplying combustion air at a rate of 5.6 cu m/min. The burners, conveyors, and motors are individually controlled and monitored with ultra-violet detection. Plant operating conditions are continuously monitored in the main plant control room and plant malfunction data is conveyed by remote signalling to an alarm system in the control room. Steam is generated on-site and injected at 54 kg/hr into five of the hearths. Waste gases are saturated with water and passed through a two-stage scrubbing unit before returning to the furnace stack. (Lisk-FIRL)
W78-11763

FLUIDIZATION TREATMENT PROCESS TO BE TRIED.
Consulting Engineer, Vol 42, No 7, p 41, July, 1978.

Descriptors: *Biological treatment, *Microbial degradation, *Nitrification, *Denitrification, *Sands, Biochemical oxygen demand, Biomass, Nutrient removal, Flow, Fluid mechanics, Waste water treatment, Municipal wastes.

The Oxitron biological treatment system, developed by Ecolotrol Inc. of New York and distributed by Dorr-Oliver, provides nitrification and denitrification of waste water. The Oxitron system consists of a reactor filled with a biomass support media, such as sand, that is expanded to more than twice its compacted size. The waste water is introduced upwards into the media at a rate sufficient to maintain fluidization of the media. The large surface area of the fluidized bed provides a higher concentration of active biomass, including bacteria and higher-order microorganisms. This higher concentration reportedly permits higher hydraulic loading rates during biological carbonaceous BOD removal. (Lisk-FIRL)
W78-11766

SYSTEM CURBS NITROGEN IN PLANT-EFFLUENT STREAMS,
Cooperative Farm Chemicals Association, Lawrence, KS.
A. D. Holiday.
Chemical Engineering, Vol 85, No 18, p 93-95, August, 1978. 2 fig, 1 tab.

Descriptors: *Chemical wastes, *Fertilizers, *Condensers, *Evaporators, *Nitrogen, Water reuse, Nitrates, Ammonia, Ureas, Steam, Boilers, Agricultural chemicals, Waste water treatment, Industrial wastes.

The Cooperative Farm Chemicals Association's nitrogen fertilizer plant in Lawrence, Kansas, utilizes waste heat to evaporate and concentrate effluent streams for ammonium nitrate and water recovery for reuse in process operations. The industrial complex contains an ammonia plant, two urea plants, six nitric acid plants, and two ammonium nitrate plants; two concentrator and condenser units have been installed for process stream treatment. Supplied with stream from the nitrate plant's atmospheric pressure neutralizer, the first concentrator produces a condensate with 0.5-1.0 weight percent ammonium nitrate, a level suitable for make-up absorber feed water. The concentrator operates at an efficiency of 90.7%. The second concentrator treats the stripper overhead from the carbon dioxide-removal system; the condensate is returned to the boiler system as feed water. The first concentrator evaporates water at a rate of 78 gal/min; the second unit has an evaporation capacity of 232 gal/min. Since the system was installed, the heat load on the cooling towers has been reduced by 12%. The ion-exchange load for demineralizing water was lowered from 200 to 120 gal/min, and the hot-lime treater load decreased to 50% of its capacity. Steam requirements were reduced by 29,000 lbs/yr; treatment chemical needs were decreased by 135 tons/yr. The system cost about $4,000-5,000/million Btu/hr of heat rejection capacity. (Lisk-FIRL)
W78-11767

CONTINUOUS FLOW DOSAGE OF FLUORINE: COMPARISON OF COLORIMETRIC AND POTENTIOMETRIC METHODS (DOSAGE EN 'FLOW CONTINU' DU FLUOR: COMPARISON DE METHODES COLORIMETRIQUE ET POTENTIOMETRIQUE),
Institut d'Hygiene, Geneva (Switzerland).
For primary bibliographic entry see Field 5A.
W78-11768

INDUSTRIAL ENVIRONMENTAL CONTROL: LEGISLATIVE, INDUSTRIAL AND SOCIAL ASPECTS,
Imperial Chemical Industries Ltd., Billingham (England). Agricultural Div.
R. Pocock, and A. Docherty.
Chemistry and Industry, No 14, p 512-516, July, 1978. 5 fig.

Descriptors: *Chemical wastes, *Fertilizers, *Air pollution, *Sulfur compounds, *Ammonium salts, Nitrogen compounds, Nitrates, Nitrites, Mercury, Proteins, Nutrients, Toxins, Filters, Water pollution sources, Waste water treatment, Industrial wastes.

Water and air pollution abatement practices at the ICI fertilizer plant in Billingham, England, are described. Atmospheric sulfur dioxide emissions have been reduced by conversion from coal to natural gas in the boiler plant. The use of liquid sulfur for the production of sulfuric acid, the replacement of ammonium sulfate with ammonium nitrate for fertilizers, and the construction of new ammonia plants have also brought about reductions. Emissions of nitrogen oxides from nitric acid plants have been decreased from 4,000 ppm in the oldest plant to less than 360 ppm in the newest plant by a more efficient absorption system. The increased recovery of nitric acid, sodium nitrite, and sodium nitrate with this system has provided additional revenue for pollution control. Fumes generated by the prilling tower production of ammonium nitrate will be controlled by irrigated filters. In exchange for the installation of trunk sewers by the local sewage authority, the industrial plant reduced its pollutant load by 50%; to comply with further agreements with the Northumbrian Water Authority, the plant will reduce its pollutant load by an additional 50%. Other discharge controls will be required when England's Control of Pollution Act becomes effective. Mercury is removed from the chlor-alkali cell effluent and cyanide ions are rendered non-toxic with sodium hypochlorite. The protein plants use ICI deep shaft effluent treatment systems to remove aerobic organisms; nutrient-rich effluent and phosphoric acid have replaced river water in some of the air scrubbing systems and have reduced the discharge of the effluent to the river. (Lisk-FIRL)
W78-11769

CHARACTERIZATION, TREATMENT, AND DISPOSAL OF WASTEWATER FROM MARYLAND SEAFOOD PLANTS,
Maryland Univ., College Park. Center for Environmental and Estuarine Studies.
R. B. Brinsfield, P. N. Winn, and D. G. Phillips.
Journal Water Pollution Control Federation, Vol 50, No 8, p 1943-1952, August, 1978. 4 tab, 14 ref.

Descriptors: *Food processing industry, *Clams, *Oysters, *Crabs, *Fish, E coli, Biochemical oxygen demand, Suspended solids, Oily water, Aerated lagoons, Sumps, Chlorination, Disinfection, Ultraviolet radiation, Ozone, Screens, Shellfish, Waste water treatment, Industrial wastes.

Samples of waste water from Maryland blue crab, fish, Atlantic oyster, and soft shell clam processing plants were evaluated for water quality standards established by federal guidelines mandating the best practical control technology currently available by 1977, and the 'best available control technology economically available' by 1983. Static screening of waste water from the hand shucking of oysters and clams produces an effluent which meets the total suspended solids, BOD, oil and grease, and pH standards established by both guidelines. While the fish processing plants in the survey met pH and oil and grease allowances, BOD and total suspended solids concentrations were higher than permitted; however, all plants are located near planned municipal treatment plants to which the effluent will ultimately be discharged. The blue crab processing effluent complied with the pH and oil and grease levels but exceeded the BOD and solids limitations. Effluent from all seafood processing plants must be disinfected before discharge and contain no more than 70 coliforms/100 ml and 0.5 mg/liter residual chlorine. Most plants exceeded both of the latter standards; E. coli populations were unusually high. Alternative treatment processes applicable to the blue crab effluent included: aerated lagoons; screening, polishing, aeration, and settling; batch biological treatment; and 20-mesh screening followed by sump tank collection and chlorination. Disinfection techniques considered for all plant effluents incorporated improved chlorination practices, ultraviolet irradiation, and ozonation. (Lisk-FIRL)
W78-11770

FRUCTOSE PLANT EXPANSION AIDED BY NEW WASTEWATER TREATMENT FACILITY.
Industrial Wastes, Vol 24, No 4, p 24-25, July-August, 1978.

Descriptors: *Food processing industry, *Treatment facilities, *Sweet corn, *Biological treatment, *Activated sludge, Aeration, Settling basins, Centrifugation, Separation techniques, Cooling towers, Sludge treatment, Dewatering, Rotors, Equipment, Nutrients, Waste water treatment, Industrial wastes.

Effluent from fructose production at the Corn Sweeteners plant in Cedar Rapids, Iowa, is treated on-site by a 3-mgd treatment plant which provides biological degradation, aeration, clarification, cyclone degritting, rotary straining, and centrifugation. Waste water from corn wet milling is cooled in a 30-ft tower and biologically treated in two aeration basins, each with a 5.2 million gal capacity. Caustic additions are used to control pH; phosphate is added if there is a nutrient deficiency. After 5-6 days of biological treatment, the effluent passes by gravity through 30-inch pipe to two 465,000 gal capacity clarifiers for 30 min of settling. Scum is skimmed from the top; clarified effluent is discharged; and activated sludge is removed for further treatment or returned to the aeration tanks. The activated sludge is distributed to one of seven degritting centrifuge units, followed by rotary strainers to remove remaining tramp and large materials. The sludge, containing 0.50-0.75% solids, is then introduced into a high-speed, disc-nozzle centrifugal thickener equipped with a rotor, impeller, and internal recycle underflow system. Effluent rises up through a disc stack and out through the rotor to an overflow tank for reuse in plant operations. Sludge is further dewatered to 6% solids and dried for other uses. The treatment system has a waste removal efficiency of about 90%. (Lisk-FIRL)
W78-11771

KINETIC MODEL FOR FLOCCULATION WITH POLYMERS,
IEC International Environmental Consultants Ltd., London (Ontario).
P. M. Huck, and K. L. Murphy.
Journal of the Environmental Engineering Division-ASCE, Vol. 104, No. EE4, p 767-784, August, 1978. 3 fig, 6 tab, 15 ref.

Descriptors: *Flocculation, *Kinetics, *Mathematical models, *Metals, *Alkalis(Bases, Polymers, Anions, Chemical precipitation, Zinc, Copper, Iron, Model studies, Design criteria, Mixing, Velocity, Waste water treatment, Mine water, Industrial wastes.

A semi-empirical model was derived to represent the kinetics of flocculation of metal hydroxides by an anionic polymer. The model expressed the supernatant particulate metal concentration subsequent to flocculation and settling as a function of the initial metal hydroxide concentration, root-mean-square velocity gradient, and time. The flocculation rate of metal precipitates followed a

second order function, dependent upon metal concentration and decreasing with time. Substantial floc breakup occurred with increased mixing time; the critical mixing level, the product of the mixing time and velocity gradient, was approximately 80,000. The model was applied to simulated and natural mine waters containing iron, zinc, or copper. The particle aggregation rate was higher for zinc than it was for iron or copper; aggregation rates higher initial metal concentrations were increased by the increased surface coverage of the polymer. The model results indicated that a short mixing and flocculation time and a high velocity gradient should be maintained during clarification. (Lisk-FIRL)
W78-11772

TREATMENT OF PLATING EFFLUENT BY SULFIDE PROCESS,
Permutit Co., Inc., Paramus, NJ.
M. C. Scott.
Products Finishing, Vol 42, No 11, p 64-70, August, 1978. 4 fig, 2 tab.

Descriptors: *Chemical precipitation, *Heavy metals, *Iron compounds, *Lime, *Alkalis(Bases), Chromium, Nickel, Copper, Neutralization, Chelation, Flocculation, Settling basins, Separation techniques, Filtration, Dewatering, Sands, Coals, Polymers, Waste water treatment, Industrial wastes.

The Phillips Plating Co. in Phillips, Wisconsin, developed the Sulfex process which utilizes iron sulfide to precipitate heavy metals from electroless nickel plating effluents. The effluents contain copper, nickel, trivalent and hexavalent chromium, and chelating agents at a pH of 0.8-2.4. The waste water is initially neutralized with lime to pH 7.0-8.0 and introduced into the precipitator where pH is maintained at 8.0-9.5. Larger than toichiometric amounts of the slightly soluble iron sulfide and a polymer are added at the inlet of the precipitator, reducing metal hydroxides to less soluble metal sulfides and hexavalent chromium to trivalent chromium for precipitation as chromium hydroxide. Waste water in the mixing zone flows through a curtain baffle into a settling zone where a dense sludge blanket bearing excess iron sulfide forms; effluent passing through this blanket is subjected to further flocculation. The supernatant contains 0.01 mg/liter copper, 0.05 mg/liter nickel, 0.71 mg/liter trivalent chromium, and 0.05 mg/liter iron. The sludge, containing 1.5-2.0% solids, is blown into a collection sump from which it passes to a recessed plate filter press for dewatering to 40% solids. Supernatant is filtered through an anthracite-sand pressure filter. (Lisk-FIRL)
W78-11773

THE INFLUENCE OF ULTRASOUND ON THE THICKENING OF THE SLUDGE FROM SOME MUNICIPAL AND INDUSTRIAL WASTES,
Politechnika Slaska, Gliwice (Poland).
E. Kowalska, J. Bien, and E. Zielewicz.
Acustica, Vol 40, No 2, p 99-103, June, 1978. 2 fig, 7 ref.

Descriptors: *Ultrasonics, *Polyelectrolytes, *Metals, *Sludge treatment, *Consolidation, Sound waves, Sewage sludge, Flocculation, Coagulation, Anions, Sedimentation, Waste water treatment, Industrial wastes.

Ultrasound and polyelectrolytes reduced the volume of concentrated sludge during the thickening of metal processing effluents and digested sewage sludge. The metal sludge, bearing a solids content of 30.3 g/cu decimeter, was treated at a dosage of 5 mg/g dry mass with anion-active flocculants (Magnafloc LT-24 or LT-25) and exposed to a sound frequency of vibration of 20 kilohertz for 2 min. Digested sewage sludge with a solids content of 17.8 g/cu decimeter was treated with 2 mg/g dry mass of Zetag 92 ot 10 mg/g dry mass of Zetag 63 and sonicated using the same frequency at 18C. Untreated inorganic sludge settled more rapidly than the untreated organic sludge. Ultrasound enhanced flocculant activity by partially emulsifying the insoluble polyelectrolyte for more uniform distribution over the solid particles. The ultrasonic waves disrupted the stability of the hydration layer, permitting replacement of the layer by polyelectrolyte macroparticles; the sonic waves also disrupted the association of water by destroying the weak dipole-dipole interaction. The metal sludge system usually reached equilibrium within 60 min of sonic treatment and generally within the first 5-8 min. The organic sludge was more amenable to flocculation with Zetag 92; the system had not reached equilibrium after 60 min but consolidation processes continued. (Lisk-FIRL)
W78-11774

CUPRIC-ION MONITOR USING ION-SELECTIVE ELECTRODE FOR INDUSTRIAL EFFLUENT, (IN JAPANESE),
Hiroshima Univ. (Japan). Dept. of Engineering.
For primary bibliographic entry see Field 5A.
W78-11775

99 PCT RECOVERY, EFFLUENT BELOW ONE PPM.
Products Finishing, Vol 42, No 11, p 42-46, August, 1978. 1 fig.

Descriptors: *Metals, *Chromium, *Nickel, *Evaporators, *Condensers, *Steam, Boiling, Heat exchangers, Separation techniques, Foaming, Equipment, Waste water treatment, Industrial wastes.

Two closed-loop, Corning evaporative-recovery units, installed at the Hon Industries' chromium-nickel plating plant in Muscatine, Iowa, reclaim more than 99% of the plating solutions, producing an effluent containing less than 1 ppm heavy metal. The two units, one for nickel and one for chromium, operate at capacities up to 50 gal/hr. The rinse from the plating tank, containing the highest concentration of metal from drag-out, overflows to a holding tank and is pumped to the evaporator. The rinse water initially enters a vertical, tubular, climbing-film evaporator which receives steam injections of 5-10 lbs/sq in; the effluent, containing anti-foaming additives, is allowed to boil. Foaming is suppressed in the separator by an impingement dome, a downward vapor entry, and a de-mister pad. When the proper chromium concentration is reached, the solution is fed back to the plating tank. Water vapor from the separator is channelled to a shell-and-tube condenser supplied with cooling water from plating operations. A vacuum pump lowers the pressure to 0.5 atm and forces condenser water back to the electroplating tanks. The recovery units can provide automatic control and shut-down in the event of malfunction. Trivalent chromium and heavy metals are removed on a cation exchange column incorporated into the chromium recovery loop. The cost of treatment chemicals that would be required to remove chrome is estimated at $12,000. (Lisk-FIRL)
W78-11776

OIL REFINERY SLUDGE - AN INDUSTRY LOOKS TO LAND CULTIVATION,
A. Frank.
Sludge Magazine, Vol 1, No 3, p 26-31, May-June, 1978. 1 tab.

Descriptors: *Oil wastes, *Application methods, *Farms, *Land use, *Land management, Agricultural engineering, Sludge, Oil industry, Heavy metals, Ultimate disposal, Waste storage, Ponds, Waste water treatment, Sludge treatment, Soil amendments, Industrial wastes.

On-site land farming of oil refinery sludges is being conducted by Exxon's Bayway Refinery and Chemical Plant in Linden, New Jersey, and by Rollins Environmental Services in Baton Rouge, Louisiana. Residues from crude, slop emulsion, distillate and additive tanks, separator bottoms, and other processes are applied at a rate of about 100-133 tons/acre/yr to an eight-acre farm plot which has a two-ft layer of impermeable clay below saline groundwater. The wastes, containing 20-25% oil, are applied weekly to a depth of 3.5 inches and disk-harrowed to a depth of 6-8 inches. The soil is monitored every two months for: temperature, which increases by 10-15F after sludge application; pH; nutrients; phosphates; oil; grease; and heavy metals. Earthen dikes at the ends of the site retain pond water and control runoff. Costs for land application average $3/ton, increasing to $8/ton when seasonal storage of the sludges is required. The 55-acre Rollins site receives 20-25 lbs/sq ft of sludge bearing 2.6% oil in the form of parafinic, naphthenic, and aromatic compounds. The sludge is disk-harrowed to a depth of 6 inches, and the plot is cultivated every 2-3 wks. The site contains a dense clay subsurface stratum at more than 50 ft and a stable water level at 60 ft. Rollins, a waste management contractor, land-applies sludges with metal concentrations of 10-100 ppm and consistencies ranging from fairly liquid to stiff. (Lisk-FIRL)
W78-11777

HIGH RATE FILTRATION OF REFINERY OILY WASTEWATER EMULSIONS,
Texas Univ. at Austin. Dept. of Civil Engineering.
M. J. Humenick, and B. J. Davis.
Journal Water Pollution Control Federation, Vol 50, No 8, p 1953-1964, August, 1978. 7 fig, 8 tab, 12 ref.

Descriptors: *Oily water, *Emulsions, *Oil industry, *Filtration, *Polyelectrolytes, Cations, Anions, Coagulation, Chemical precipitation, Separation techniques, Suspended solids, Head loss, Hydraulic design, Coals, Sands, Filters, Interfaces, Waste water treatment, Industrial wastes.

High-rate or pressure filtration of oil-in-water emulsions through a sand and anthracite filter was assessed according to the oil and suspended solids content of the filtrate and the head loss under various conditions. Alum and cationic, anionic, and nonionic polyelectrolytes were evaluated as filtration or coagulation aids. Flow rates were varied over 4.3-10.2 liters/sq m/sec; influent oil and suspended solids concentrations encompassed 100, 300, or 500 mg/liter. Cationic polyelectrolytes were more effective filter aids than the other agents tested; with a cationic polyelectrolyte, the high-rate filter could accomodate effluent volumes up to 98 cu m/sq m of filter area. Higher volumes of treated effluent were achieved at the lowest filtration rate. Effluent suspended solids concentrations were found to be inversely proportional to the emulsion volume filtered; a five-fold increase in suspended solids reduced the filtered volume to 20-25%. Filter performance was not significantly affected by the influent oil concentration or the type of oil in the emulsion. Headloss occurred primarily at the top of the filter and at the sand and anthracite interface; air scour was required to backwash the filter. The lowest oil effluent concentrations obtained by this filtration process were in the range of 6-9 mg/liter. (Lisk-FIRL)
W78-11778

HYDROCARBON EMISSIONS FROM REFINERY WASTEWATER AERATION,
C. P. Richardson, and J. O. Ledbetter.
Industrial Wastes, Vol 24, No 4, p 26-28, July-August, 1978. 3 tab, 17 ref.

Descriptors: *Organic compounds, *Oil wastes, *Air pollution, *Activated sludge, *Aeration, Mathematical models, Chemical oxygen demand, Carbon, Oily water, Volatility, Waste water treatment, Industrial wastes.

An estimation methodology was developed for measuring hydrocarbon emissions by air stripping during aeration of oil refinery waste water. A mathematical model for air stripping considered the rate of change in effluent concentration as proportional to the quantity of removable volatiles present at any time and the interfacial available for transfer. Air stripping constants at aeration rates of 1, 3, and 5.3 liters/min/liter waste were calculated from the rate of total organic carbon removal during the aeration of a combined industrial effluent. The stripping rate constants from the remaining total organic carbon were expressed as a function of the maximum fraction of strippable material, the fraction of refractory material, the aeration time, and the stripping rate constant. Hydrocarbon emissions from a waste water treatment plant's six-bay aeration basin amounted to 17.2 ppm as methane at the entrance to the basin, 8.9 ppm at one-third the distance, 3.4 ppm at two-thirds of the distance along the basin, and 2.8 ppm at the end of the basin. An exponential decrease in hydrocarbon concentration was observed as the distance along the aeration basin increased; the representative hydrocarbon concentration was estimated at 7.3 mg/liter. Calculations of emissions by a hypothetical refinery producing 50 gal effluent/barrel of oil containing a COD concentration of 600 mg/liter demonstrated that 1.5% of the total hydrocarbon concentration was emitted by activated sludge treatment of the wastes. (Lisk-FIRL)
W78-11779

TMP EFFLUENTS: A REVIEW,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
For primary bibliographic entry see Field 5A.
W78-11780

CONVERSION OF SULFITE PULPING WASTE TO AN AGRICULTURAL PRODUCT,
Charmin Paper Products Co., Mehoopany PA.
W. A. Eberhardt, J. L. Lewis, J. L. Scharp, and C. A. Barton.
Journal Water Pollution Control Federation, Vol. 50, No. 8, p 1893-1904, August 1978. 8 fig, 11 tab, 12 ref.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Activated sludge, *Drying, *Dewatering, Sulfite liquors, Fertilizer, Feeds, Fish diets, Turf grasses, Heat treatment, Waste water treatment, Sludge treatment, Industrial wastes.

An activated sludge flash dryer operating at the Mehoopany, Pennsylvania, plant of Procter and Gamble Paper Products Co. reduces the moisture content of sulfite pulping wastes to about 7.17%. Pulping waste water is introduced into an equalization basin followed by phosphoric acid and lime additions. The effluent is treated in two basins equipped with aerators providing a total of 600hp. Following clarification, the waste activated sludge is concentrated to 5-6% solids by a disc centrifuge and further dewatered to 13-18% solids in a solid-bowl centrifuge. The sludge is introduced into a chest for metered feed to a mixer where it is combined with a dry fertilizer feed. The temperature of 316-649C. The sludge and hot gas are pneumatically conveyed up through an air lift dryer duct and into a cyclone for gas-solids separaton. Particulate emissions from the cyclone have been reduced to within standards by modifying the dryer air heater and installing a gravity separator and an impingement scrubber. The dried product contains an average of 1.75% phospeoric acid and low heavy meta concentrations. The material, which is subsequently sold as a turf grass fertilizer, has also been found as effective fish food supplement. The net cost of the drying process, after the product is sold for fertilizer, is about $42/metric ton. (Lisk-FIRL)
W78-11781

ASSESSMENT OF MODELS FOR STORM AND COMBINED SEWER MANAGEMENT.
Y. Wada.
Technology Reports of the Kansai University, No. 19, p 109-114, March, 1978. 2 fig, 3 tab, 6 ref.

Descriptors: *Storm drains, *Combined sewers, *Surface runoff, *Mathematical models, *Simulation analysis, Analytical techniques, Deposition(Sediment), Sewerage, Urban runoff, Model studies, Waste water disposal, Hydraulic engineering, Municipal wastes.

Five mathematical models were evaluated for accuracy in predicting storm and combined sewer runoff and pollutant deposition in storm and combined sewer systems. The Complete Mixing model and the Inaba model offered combined calculations of surface and pipe-deposit runoff. The Energy Operation model was a runoff model for pipe deposited systems. Combined runoff models incorporating the conservative momentum equation for pipe deposited systems. Combined runoff models incorporating the conservative momentum equation for water quality and quanity included the Deposited Pollution Load Model and the Scored Pollution Load model. While all the models were considered easy to use, the Energy Equation model and the Deposited Polltuion Load model were found to be more accurate in simulating runoff pollutant load on application to the Osaka, Japan, drainage system. The Energy Equation model calculated the runoff pollutant load as a function of critical scored flow, runoff rate, and residual load. A high degree of correlation was apparent between the observed and simulated BOD, ammonia-nitrogen, and phosphate loads in the runoff. The Deposited Pollution Load model calculated the surface runoff pollutant load, the flow rate, and the quantity of deposited pollutants as functions of water depth, rainfall intensity, catchment area, residual load, and travel time. (Lisk-FIRL)
W78-11783

WATER POLLUTION CONTROL WITH INTERCEPTORS,
L. Blenderman.
Domestic Engineering, Vol. 232, No. 1, p 38-40, 80, July, 1978. 6 fig, 1 tab.

Descriptors: *Interceptor sewers,*Oil wastes, *Maintenance, *Regulation, *Building codes, Inspection, Separation techniques, Sanitary engineering, Sewerage, Waste water treatment, Municipal wastes.

The country of Monroe, New York, adopted a sewage use law to control the size, installation, and servicing of grease, oil, and solids, interceptor sewers. Faulure to empty sewers or improper cleaming practices by interceptor sewer owners, such as restaurants, gas stations, and food processing plants, led to the adoption of inspection and fining regulatons. The county inspects the number of hook-ups, the flow volume, and the type and size of the interceptor to be installed before a building permit is issued. The contractor or plumber must comply with regulations for flow restriction units and baffles and interceptor iocation; he must also instruct the owner in the use and mainteance of the interceptor. When an interceptor becomes plugged due to an owner's failure to empty it, the county cleans the sewer and a violation citation is issued. the occurrence of a second plugging subjects the owner to a waring, followed by a fine and a cleaning charge for the third plugging incident. Cleveland, Ohio, has simular sewage use laws. (Lisk-FIRL)
W78-11784

THE EFFECT OF WASTE WATER REUSE IN COLD REGIONS ON LAND TREATMENT SYSTEMS,
Army Terrestrial Sciences Center, Hanover, NH.
I. K. Iskandar.
Journal of Environmental Quality, Vol. 7, No. 3, 361-368, July-September, 1978. 5 fig, 5 tab, 26 ref.

Descriptors: *Application method, *Soil tests, *Soil amendments, *Nutrient removal, *Leaching, Return flow, Nitrates, Ammonia, Grasses, Loam, Silts, Biochemical oxygen demand, Phosphorus, Nitrogen, Cold region, Waste water treatment, Waste water disposal, Municipal wastes.

The impact of land applicaton fo primary and secondary effleunt on ground-water quality, solids, and vegetation in cold climates was investigated over a 2-yr period at the Arm's Cold Reguons Laboratory in Hanover, New Hampshire. Three cells containing Windsor sandy loam and three contangin Charlton silt loam with depths of 150 cm were established; for a 1-yr period, two sandy laom cells received 5 and 15 cm/wk secondary effluent and one silt loam cell received 5 cm/wk. The other test cells received 7.5 cm/wk primary effluent. Vegetation, primarily quackgress, was harvested six times over the two-year period. Test cell leachate for the 1-yr period contained 8.1-16.3 mg/liter total nitrogen, is less then 0.5 mg/liter total phosphorus, 8.5-10.3 mg/litter organic carbon, 0.6-2.1 mg/litter BOD, and 21.9-28.0 mg/litter chloride. High nitrate concentrations in the leachate during early summer were attributed to oxidation of ammonia stored in the soils during winter months; the ammonia was oxidized to nitrate within the top 45 cm of the soil. Nitrogen removal was primarilty by plant growth and percolation. Effluent applicaton at a rate of 15 cm/wk to one test cell consistently produced a leachate containing an excess of nitrate-Nitrogen for 9 mos of the year. Heavy metals were confined primarily to the top 15 cm of soil; leaching below this level was attributed to a decrease in soil pH. (Lisk-FIRL)
W78-11787

POLIOVIRUS REMOVAL FROM PRIMARY AND SECONDARY SEWAGE EFFLUENT BY SOIL FILTRATION,
Baylor Coll. of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
C. P. Gerba, and J. C. Lance.
Applied and Environmental Microbiology, Vol. 36, No. 2, p 247-251, August, 1978. 2 fig, 3 tab, 22 ref.

Descriptors: *Viruses, *Adsorption, *Soil filters, *Sewage effluents, *Application methods, Analytical techniques, Hydrologic aspects, Sands, Loam, Columns, Separation techniques, Return flow, Activated sludge, Sampling, Waste water treatment, Municipal wastes.

The adsorption of poliovirus from primary and secondary effluents was examined using packed soil columns 250 cm in length and batch tests with loamy sand. Virus-seeded primary and secondary effluents were applied for nine consecutive days to soil columns; fluid samples were collected at various depths along the columns. Batch tests were conducted in a centrifuge with varying soil concentrations and constant virus concentrations. Poliovirus adsorption on the soil columns was similar for both primary and secondary effluent. In 1-ml samples, viruses were not detectable below 40 cm in primary or secondary effluent flooded columns; in one case, viruses reached a depth of 80 cm in secondary effluent tests. Passage of the effluents through the top 5 cm of the columns removed about 1 log of virus, but the removal of another log of virus required passage through an additional 35 cm of soil. The viable virus concentration after one day of storage decreased by about 50% in primary effluent and by 57% in secondary wastes. About 5 plaque-forming units/ml were desorbed from the soil column to a depth of 80 cm by flooding with deionized water immediately after primary effluent application. The adsorption of poliovirus was not influenced by the organic concentration at the various depths but was directly dependent upon the soil type; low adsorp-

tion occurred with unconsolidated silty sand and gravel. (LisksFIRL)
W78-11789

SLUDGE GAS AN ENERGY SOURCE IN SEWAGE WORKS,
M. Bicknell.
Civil Engineering, p 61, 63, 65, May, 1978. 9 ref, 2 append.

Descriptors: *Sludge digestion, Methane, *Anaerobic digestion, *Fuels, *Reclamation, Carbon dioxide, Nitrogen, Heat treatment, Gases, Incineration, Boilers, Heat balance, Waste water treatment, Sludge treatment, Municipal wastes.

The use of methane gas from sludge digestion is discussed as a fuel source for sewage treatment plant operations. A plant serving 1,000 people, utilizing sludge digestion tanks with a 30 day capacity of 82.5 cu m, can supply 30 cu m/day of digestion gas. The gas contains methane, carbon dioxide, and nitrogen, with a caloric value of 24.5 megajoules/cu m. While small plants may not economically utilize the surplus digestion gas produced, power costs to heat boiler water, which raises the sludge digestion temperature to 35C, could be offset if the boiler system were expanded to also provide heating of offices and laboratories in small treatment plants. In large plants serving a population of 100,000 people, digestion gas ca be generated at a rate of 3,000 cu m/day at an available energy supply of 73,500 megajoules/day. Sludge digestion also has the advantage of easier sludge handling and may provide fuel for sludge incinerators. (Lisk-FIRL)
W78-11790

SEWERAGE STUDY HITS SOUTH TAHOE AWT COSTS.
Engineering News-Record, Vol. 201, No. 4, p 11, July 1978.

Descriptors: *Tertiary treatment, *Application methods, *Irrigation systems, *Ultimate disposal, *Cost comparisons, Nitrification, Nutrient removal, Reverse osmosis, Water reuse, Treatment facilities, Capital costs, Operation and maintenance, Waste water treatment, Municipal wastes.

South Lake Tahoe, Nevada, has been advised by the engineering firm of Culp, Wesner, Culp, of El Dorado, California, to convert from advanced waste water treatment to secondary tratment with irrigation disposal. Designs for expanding the 7.5 mgd tertiary treatment plant to 10 mgd demonstrated that secondary treatment with land application would require $20 million in capital expenditures and $1.4 million annually for operation and maintenance. This expense represents an annual savings of 27% plus an additional 50% energy consumption reduction. Nitrogen removal sould require $32 million in capital expenditures and $2.7 million for maintenance; expansion to nitrification would require capital expenditure of $25 million with annual maintenance costs of $2.5 million. A 1 mgd reverse osmosis water reclamation demonstration plant in addition to secondary treatment and land application was also considered; capital and operating costs were estimated at $2.5 million, respectively. (Lisk-FIRL)
W78-11791

MUNICIPAL SEWAGE SYSTEM SPRINGS 20-25 MILLION GALLON PROBLEM,
B. B. Mackay, Jr.
Solid Wastes Management, Vol. 21, No. 7, p 56, 58, July, 1978.

Descriptors: *Oxidation lagoons, *Reservoir leakage, *Human diseases, *Sewage, *Groundwater, Potable water, Water supply, Water pollution source, Waste water treatment, Municipal wastes.

The leakage of raw seage and sludge from oxidation lagoons into groundwater caused the illness of 700 residents in the area of West Plains, Missouri, in June 1978. The oxidation lagoons, constructed in caverned and fissued limestone, developed holes soon after completion in 1964. The first hole, which developed in the lagoon before it was completely operational, was 17 ft in diameter and between 10-20 ft deep. A second hole, which was 34 ft wide and 10-20 ft deep, developed in 1966 and released about 40 million gal of sewage into the ground water. Local authorities reportedly did not notify state agencies or the public of the leaks. The third leak occurred in May 1978 in the 37-acre lagoon; the local health department and the public were reportedly not informed of the new break in the lagoon until five days after it occurred. Residents in the town and surrounding area developed symptoms similar to dysentery and influenza. Water supplies had to be imported to the area by the National Guard. The lagoon was repaired before a geologic report was completed; a new treatment facility is planned for construction on the same site as the lagoons. (Lisk-FIRL)
W78-11794

THE WRC-WHERE THEY KNOW A BIT ABOUT WATER AND ARE LEARNING ALL THE TIME.
For primary bibliographic entry see Field 5G.
W78-11795

DEVELOPING NATIONS FACE PROBLEMS IN WATER AND WASTEWATER MANAGEMENT,
C. L. Larrick, and L. W. Adams.
Water and Sewage Works, Vol. 125, No. 6, p 62-63, June, 1978.

Descriptors: *Sewage, *Water supply development, *Sewerage, *Social aspects, *Governments, Social values, Financing, Priorities, Industrial wastes, Project feasibility, Future planning(Projected), Waste water treatment, Municipal wastes.

The past, present, and future status of water treatment and sewerage in developing countries is reviewed. Many developing nations are still serviced by pre-World War II water and waste water systems that are now inadequate for the population. The World Health Organization has financed feasibility studies for water and waste water management surveys in developing countries through the World Bank. Marginal progress has been achieved in urban centers within the past 10-15 yrs; sewerage systems are not often considered as important as a water supply system. Industrial development in emerging countries often occurs at the expense of sewerage systems and the environment; the governments and populations of developing countries should be made aware of the environmental impact of unrestricted industrial expansion. Water and waste water management and development are often not priorities in these countries. This has resulted in a large number of foreign-born engineers and scientists, trained in the United States and elswhere, who do not have positions to return to in their own countries. There is also a lack of trained management, administrative, and operations and maintenance personnel for water quality management projects in these countries, (Lisk-FIRL)
W78-11796

HEALTH EFFECTS OF LAND APPLICATION OF WASTEWATER AND SLUDGE: WHAT ARE THE RISKS,
Texas Univ. at San Antonio. Center for Applied Research and Technology.
C. A. Sorber, and B. P. Sagik.
Water and Sewage Works, Vol. 125, No. 7, p 82-84, July, 1978. 3 tab, 5 ref.

Descriptors: *Application method, *Sewage sludge, *Sludge disposal, *Waste water disposal, *Pathogens, Toxins, Metals, Salmonella, Protozoa, Viruses, E. coli, Seepage, Pathogenic bacteria, Diseases, Human diseases, Environmental effects, Waste water treatment, Municipal wastes.

The potential impact on public health of toxic materials and pathogenic organisms contained in waste water and sewage sludge applied to land was discussed at the 1977 Conference on Risk Assessment and Health Effects of Land Application of Municipal Wastewater and Sludge. Studies have concluded that pathogens can survive sewage treatment; pathogens isolated from sewage include salmonellae, shigellae, E. coli, enteric viruses, several species of protozoa, and a number of helminths. Transmission of disease from these pathogens by sewage applications to land, however, was considered unproven. Organic chemicals and metals present in primary sewage effluent were considered potential sources of groundwater contamination through toxin migration or seepage from land application sites. More research into the impact of these toxins on public health and their fate after land application of sewage was recommended. Another consideration in evaluating land application of wastes was the accuracy of epidemiological techniques to identify and quantify pathogens in waste water. Because of the nature of viral infection transmission, the source of a disease can be difficult to trace. The total removal of viruses from wastes was recommended before land application. (Lisk-FIRL)
W78-11797

ANSWERING MECCA'S SEWERAGE PRAYERS.
World Water, Vol. 1, No. 1, p 42-43, 45, May, 1978.

Descriptors: *Sewerage, *Treatment facilities, *Storm runoff, *Diversion structures, *Asbestos cement, Concrete pipes, Clay pipes, Epoxy resins, Humus, Filters, Sludge digestion, Dewatering, Sewage treatment, Construction materials, Equipment, Aqueducts, Potable water, Irrigation, Waste water treatment, Municipal wastes.

Sewage treatment facilities and sewer systems in Mecca, Saudi Arabia, must accommodate flows during pilgrimate periods that are double the normal flows. The English engineering consulting firm of J. D. and D. M. Watson has designed and supervised the construction of 65 km of trunk sewers, up to 1.02m in diameter, and 200 km of smaller sewers. To prevent corrosion of sewer pipes by thiobacillus concretivorus, the sewers have been installed with adequate gradients to prevent siltation and septicity; the trunk pipes are constructed of clayware and the minor sewers are asbestos cement lined with epoxy to resist sulfide corrosion. Periodic floods are controlled by a network of trapezoidal concrete-lined and channels surrounding the city to divert surface runoff from flowing into the dry river beds that comprise the city's main streets. One network of channels is 2 m deep, 2 m wide at the base, and 10 m wide at the top; the other network has channels with depths of 2.5 m and a bottom-to-top width range of 1.5-6.5 m. The only operational sewage treatment plant employs primary treatment, filter beds, humus tanks, primary digestion tanks, and sludge drying beds. Treated effluent may eventually irrigated green belts around the city; effluent is currently discharged into the dry river beds. The Watson engineering firm also supplied the designs for upgrading Mecca's 9th century vintage aqueduct water supply system. (Lisk-FIRL)
W78-11798

SOME THOUGHTS ON PIPELINES PAST, PRESENT AND FUTURE,
For primary bibliographic entry see Field 8G.
W78-11799

THE LAYING OF UNDERWATER POLYETHYLENE PIPELINES USING THE ATMOSPHERIC COUNTERPRESSURE METHOD (DAS VERLEGEN VON SEELEITUNGEN AUS POLYATHYLENROHREN IM LUFTGEGENDRUCKVERFAHREN),
For primary bibliographic entry see Field 8G.
W78-11800

DISPATCHER SIGNALIZATION OF OPERATIONAL DISTURBANCES IN SEWER SYSTEM PUMP STATIONS (AID FOR DESIGNERS) (DISPETCHERSKAYA SIGNALIEATSIYA O NARU SHENII NORMAL'NOGO REZHIMA RABOTY KANALIZATSIONNYKH NASOSNYKH STANTSII (V POMOSHCH' PROEKTIROVSHCHIKU),
For primary bibliographic entry see Field 8G.
W78-11801

FEASIBILITY OF THE USE OF HYDROGEN PEROXIDE IN OVERLOADED WASTE-WATER PURIFYING PLANTS (MOZNOSTI VYUZITI PEROXIDU VODIKU V PRETIZENYCH CISTIRNACH ODPADNICH VOD),
Krajska Hygienicka Stanice Prague (Czechoslovakia).
J. K. Cerny.
Ceskoslovenska Hygiena, Vol. 22, No. 10, p 474-480, 1977. 4 tab, 4 ref.

Descriptors: *Aeration, *Oxygenation, *Hospitals, *Aerated lagoons, *Aqueous solutions, Oxygen, Activated sludge, Biological treatment, Alkalis(Bases), Waste water treatment, Laboratory tests.

Hydrogen perioxide was tested as an additional source of oxygen in waste water aeration treatment tanks during laboratory tests and in an overloaded plant treating waste water from a medical facility for tuberculosis and respiratory diseases. The results indicated that 1 kg oxygen could be added to the waste water for each 7.5 liter addition of a 40% hydrogen peroxide solution. The addition of hydrogen peroxide enhanced the activity and composition of the activated sludge organisms. Metered additions of hydrogen peroxide were consiered economically feasible in the event of treatment plant overloading or aeration equipment failure. There were problems associated with the handling of the caustic hydrogen peroxide. (Lisk-FIRL)
W78-11802

SMART SHOPPERS CUT COST OF TREATMENT PLANT.
Engineering News-Record, Vol. 201, No. 4, p 24, 28-29, July, 1978.

Descriptors: *Treatment facilities, *Activated sludge, *Oxygen, *Contracts, *Bids, Computers, Construction, Concrete piles, Piles(Foundations), Timber piles, Outfall sewers, Construction materials, Waste water treatment, Municipal wastes.

The division of a $364 million waste water treatment plant construction project into 18 separate contracts has saved an estimated $50 million. Construction of the Passaic Valley, New Jersey, plant is under the supervision of Charles A. Manganaro consulting engineers of New York City who staggered the bid dates of 11 of the contracts over an 11-mo period to take advantage of market fluctuations. The first phase of the project, a 300 mgd computerized pure oxygen-activated sludge system, is being constructed on timber piles and 60 tons concrete shell piles, driven 30-60 ft into a swampy site 10 ft above sea level. Oxygen injections of 600 tons/day will treat mixed municipal and industrial effluent with BOD and suspended solids loads of 400 ppm. A five mile 12-ft diameter outfall discharging waste water into New York Harbor will be converted from a gravity flow line to a pumped system. The second state of the project, still under design will include upgrading and some new construction for primary treatment system. (Lisk-FIRL)
W78-11803

THE FILTER BELT PRESS-APPLICATION AND DESIGN,
Simon-Hartley Ltd., Stoke-on-Trent (England).
E. P. Austin.
Filtration and Separation, Vol. 15, No. 4, p 320, 324, 326, 329-330, July/August, 1978. 4 fig, 1 tab.

Descriptors: *Sludge treatment, *Dewatering, *Filtration, *Polyelectrolytes, *Activated sludge, Gravity, Flocculation, Chemical precipitation, Equipment, Filters, Construction materials, Municipal wastes.

The design and application of filter belt presses are described for sludge dewatering. Free water within organic sludge is removed by gravity dewatering to produce a sludge containing 10% solids; intercellular water, chemically bonded around the sludge particles, is removed by chemicaly conditioning with a polyelectrolyte. Intracellular water within the biomass cells is expensive to remove and contributes to a higher BOD load. Compaction dewatering is usually accomplished on monoflament polyester filter belts, with small length-to-width ratios. The selection of filter belts, with tensile warp strengths ranging 140-280 kg/cm, depends upon the mechanical strength of the filter press machinery, the sludge characteristics, and the desired degree of dewatering. Municipal sludges can be dewatered to 20-45% solids; dewatering is enhanced by the ash content of the sludge. The range of polyelectrolyte dosages is larger for sludges with lower feed solids concentrations, such as oxidation ditch and activated sludges; stable digested sludges accommodate a much narrower range of optimum polyelectrolyte dosages. (Lisk-FIRL)
W78-11804

INFILTRATION THROUGH SOIL AS A TERTIARY TREATMENT OF SEWAGE EFFLUENT,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
C. W. Childs, P. L. Searle, and N. Wells.
New Zealand Journal of Science, Vol. 20, No. 4, p 433-437, December, 1977. 1 fig, 5 tab, 4 ref.

Descriptors: Infiltration, *Soils, Sewage disposal, *Tertiary treatment, *Nutrient removal, Sands, Clays, Loam, Silts, Phosphorus, Nitrogen, Coliforms, Flooding, Irrigation practices, Waste water treatment, Municipal wastes.

Infiltration of secondary effluent through ten 50-cm core soil samples from North Island, New Zealand, was used to investigate the effectiveness of the soils in tertiary treatment of municipal sewage. The soils included three silt loams, a stony loam, clay, two sandy loams, sand, sandy silt, and peat. The soil columns, with vegetation intact, were irrigated for 10 mos with tap water or seconary effluent at a rate of 55 mm/week during the warmer months and 27.5 mm/week during winter months; the soils were also flooded weekly for 24 hrs during a 5-mo test priod. Leachates were analyzed for Na, K, Mg, Ca, Mn, Al, Fe, ammonium-N, nitrate-N, kjeldahl-N, total-P, F, and coliforms. The Otorohanga silt loam and the Taupo sandy silt produced leachates with 2.0 mg/liter or less total-N and 0.07 mg/liter or lss total-P under systematic irrigation and flooding conditions. These soils also consistently achieved the lowest coliform counts. The dry weight of the pasture vegetation on all columns treated with effluent was narly double the weight of plants watered with tap water. (Lisk-FIRL)
W78-11805

EDINBURGH SINKS (POUNDS STERLING) 35M IN UNDER CITY AND SEA SEWERAGE,
T. Paynting.
Surveyor, Vol 4481, No 151, p 17-18, April, 1978.

Descriptors: *Treatment facilities, *Interceptor sewers, *Sewerage, *Outfall sewers, *Construction costs, Settling basins, Screens, Separation techniques, Storm drains, Waste water disposal, Tunnels, Waste water treatment, Municipal wastes.

Edinburgh, Scotland's, 35 million pounds sterling sewage treatment project included the construction of a 55 mgd primary treatment plant, 8.4 km of interceptor lines, and a 2.8 km long outfall sewer. The treatment facility, with an ultimate design capacity of 74 mgd, was constructed on a stone graded foundation enclosed by a sheet-piled cofferdam. The plant has triple feed channels, bar screens, a feed conveyor belt to the screenings press, detritor tanks, and four 55 m-diameter sedimentation tanks. Interceptor sewers with diameters of 3,124 mm and 2,290 mm connect to the older sewers and have provisions for automatic storm overflow control. The outfall sewer was constructed in an undersea tunnel with a treatment plant access point located 52 m below the surface. The tunnel diminishes in diameter from 3.6 m to 0.9 m; it is equipped with 20 diffuser pipes located along the outer 760 m. Sewage sludge is discharged 16 km offshore by a specially designed vessel with a sludge capacity of 2,500 tons. (Lisk-FIRL)
W78-11806

NINE PUMP INSTALLATION FOR WESSEX WATER AUTHORITY.
For primary bibliographic entry see Field 8C.
W78-11807

PLANT TO DISINFECT WASTEWATER WITH OZONE,
R. K. Allen, and V. C. Oblas.
Water and Sewage Works, Vol 125, No 7, p 48-53, July, 1978. 4 fig, 2 tab.

Descriptors: *Ozone, *Activated sludge, *Disinfection, *Design criteria, *Treatment facilities, Specifications, Bids, Cost analysis, Oxygenation, Project planning, Municipal wastes, Sewage treatment, Aeration, Equipment, Waste water treatment.

A $38 million region project in western Washington include separation of storm and sanitary sewers and construction of the 13.9 mgd LOTT seconary treatment plant. The plant will utilize an equalization basin, a high-purity oxygen activated sludge system, and an ozone disinfection system to accommodate a BOD loading of 13,744 kg/day, an equalized flow of 35 mgd, and a maximum fow for partial treatment of 137 mgd. Space limitations at the existing site and the need to improve the quality of receiving waters provided additional impetus for selecting the ozone/oxygen process. Prior to design finalization, three modes of ozone-oxygen treatment were tested: air-fed, oxygen-fed once-through, and oxygen-fed recycle. Comparisons of the oxygen-fed systems according to process performance, control complexity, power requirements, track record, and current technology led to the selection of the once-through mode of operation for LOTT. Ozone generation will be controlled by the waste water flow and the oxygenation basin line pressure. Design specifications for LOTT's ozonation basin include: two contact chambers; an ozone dosage of 10 mg/liter; a detention time of 16 min; a 5.8 m-deep vertical baffled tank; tubular fine bubble diffusion equipment, submerged to 4.88 m; and a diffuser pore size of 60 microns. Bid specifications for the ozone generation equipment are designed to give consideration to capital cost, power efficiency, and heat recovery capability. (Schulz-FIRL)
W78-11808

FLUID TREATMENT WITH PLASTICS PASTA.
Consulting Engineer, Vol 42, No 7, p 40-41, July, 1978.

Descriptors: *Trickling filters, *Percolation, *Packed beds, *Filtration, *Plastics, Biological treatment, Construction materials, Strength, Distribution, Organic loading, Filters, Waste water treatment, Municipal wastes.

Acalor International Ltd. has designed Biofil, an injection molded filter medium for percolating or trickling filters, absorption towers, and gas scrubbing systems. The spherical Biofil medium has triangular faces, a configuration that contributes to the strength of the material. The triangular faces are outlined by two serrated-edges interlock, providing greater stability to the packed bed, and allow for random packing of the media. Biofil promotes even contact time and uniform distribution of the waste water through a seris of planes. The use of Biofil media can reduce filter construction costs and size. (Lisk-FIRL)
W78-11809

ELECTROLYTIC DISINFECTION.
Consulting Engineer, Vol 42, No 7, p 41, 43, July, 1978.

Descriptors: *Electrolysis, *Disinfection, *Chlorination, *Cathodes, *Anodes, Platinum, Titanium, Hydrogen sulfide, Iron oxides, Saline water systems, Cesspools, Coliforms, Screens, Waste water treatment, Municipal wastes, Outfall sewers.

An electrolytically-produced hypochlorite solution, derived from sea water, is used to disinfect sewage from the English Channel island of Guernsey. The hypochlorite solution is obtained by passing sea water through a 3 mm gap between a platinized titanium anode and a mild steel cathode contained in two pairs of enclosed glass fiber electrolytic cells. Waste water from cesspools is treated at the rate of 7,000 gal/hr by treatment with ferric oxide for hydrogen sulfide removal, followed by metered treatment with the hypochlorite solution. The hypochlorite reduces bacillus coli in the sewage by 99.9%; the waste water is then screened, pumped to two 5,000 gal reactor tanks, agitated, and discharged to the oufal sewer. Power costs for pumping equipment and electrolysis were about 245 pounds sterling for one month; a similar treatment plant has been constructed at the island's Bellegreve outfall at Saint Peter Port. The treatment system replaced direct discharge of sewage through an outfall sewer to the sea. (Lisk-FIRL)
W78-11810

PREFAB PUMPING STATIONS.
For primary bibliographic entry see Field 8C.
W78-11811

LAND TREATMENT OF WASTEWATER AS AN INNOVATIVE OR ALTERNATIVE TECHNOLOGY,
S. J. Hadeed.
Journal Water Pollution Control Federation, Vol. 50, No. 7, p 1709-1712, July, 1978. 1 fig.

Descriptors: *Application methods, *Legislation, *Spray irrigation, *Overland flow, *Infiltration, Return flow, Percolation, Cost analysis, Grants, Treatment facilities, Water conservation, Waste water treatment, Municipal wastes, Waste water disposal.

The 1977 Clean Water Act gives consideration to innovative and alternative waste water treatment processes. The act considers unconventional projects with total costs 15% more than the most cost-effective conventional projects as competitive; thus, grant eligibility would be extended to innovative projects with higher costs. These novel systems are defined as resource recovery processes, such as land application, water reuse, and energy recovery. Other criteria require: that the energy costs were 20% less than those required for the most cost-effective conventional system; that the process be relatively safe from upset and operational malfunctions; that toxins management be improved; that the project conserve water, land, and resources; and that methods incorporate treatment of both municipal and industrial wastes. Land application alternatives include overland flow, infiltration-percolation, and spray irrigation. The 28 mgd Muskegon, Michigan, biological treatment facility applies secondary effluent to corn crops by spray irrigation. While the facility has realized a 60% operating cost reduction from corn crop revenues, criticism has been directed at the site location, the potential groundwater contamination, the design of the storage lagoons, and the results of pilot plant tests. The act also requires that construction materials and treatment equipment be manufactured in the United States. (Lisk-FIRL)
W78-11813

REGIONAL WASTEWATER TREATMENT SYSTEMS IN JAPAN,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
E. D. Brill, Jr., and M. Nakamura.
Journal Water Pollution Control Federation, Vol. 50, No. 7, p 1715-1726, July, 1978. 4 fig, 5 tab, 29 ref.

Descriptors: *Regional development, *Treatment facilities, *Interceptor sewers, *Sewerage, *Project planning, Land use, Drainage, Urban runoff, Urbanization, History, Economies of scale, Cultures, Waste water treatment, Municipal wastes.

Planning and implementation of regional waste water treatment facilities were surveyed in Japan. Japan's urban area has more than doubled since 1963 and the population served by drainage has increased from 7.4 to 22.6%; between 1976-1980 Japan is expected to spend $25 billion for sewerage. Prefectural governments in Japan are currently conducting a comprehensive regional planning program to design and implement waste water treatment facilities and sewerage projects. Waste water treatment planning in Japan encompasses a study of historical and cultural frameworks, short-run economies of scale, short-run effectiveness, and long and short-run flexibility. Other factors considered in comprehensive regional planning include drainage, water supply, and land use; the prefectural governments are responsible for planning projects, with the cooperation of the community; they also own and operate central facilities and interceptors. Although local communities do not directly participate in the regional planning projects, a program for the dissemination of public information provides public hearings, meetings, and tours of completed facilities. (Lisk-FIRL)
W78-11814

TURNING SLUDGE INTO SOIL CONDITIONER SOLVED A CITY'S DISPOSAL PROBLEM,
Water Pollution Control Div., Philadelphia, PA.
For primary bibliographic entry see Field 5E.
W78-11815

EFFECTIVENESS OF BACKWASHING FOR WASTEWATER FILTERS,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State Univ., Ames. Engineering Research Inst.
J. L. Cleasby, and J. C. Lorence.
Journal of the Environmental Engineering Division-ASCE, Vol 104, No EE4, p 749-765, August, 1978. 3 fig, 6 tab, 6 ref.

Descriptors: *Trickling filters, *Cleaning, Materials, *Fluid friction, *Scour, Air circulation, Pilot plants, Sands, Coals, Filtration, Granules, Treatment facilities, Depth, Waste water treatment, Municipal wastes.

A four-year study of backwashing practices suitable for municipal trickling filters has concluded that single media filters are most effectively washed by simultaneous air scour and subfluidization backwash. Water fluidization, air scour prior to water fluidization, and surface wash and subsurface wash before and during fluidization backwash were tested on three pilot-scale trickling filters packed with single, dual, or mixed media to treat secondary effluent. Single medium filters containing coarse sand had bed depths of 24-60 inches; the total depth of the dual coal and sand filter was 24 inches; the tri-media coal, sand, and garnet filter was 27 inches deep. Air scour or surface wash was considered essential for proper performance of filter beds within these depth ranges; these practices, in conjunction with water fluidization backwashing, were considered feasible but not optimum for all filter types tested. Separate backwashing of three coarse sand filters with different depths demonstrated that the initial 8 gal/min/sq ft backwash flow rate utilized during simultaneous air-water wash and water wash alone was insufficient; increasing the water flow rate to 15 gal/min/sq ft at an air flow rate of 8 cu ft/min/sq ft immediately improved media condition. A 12-15 inch bottom layer of media remained dirty; provisions were recommended for preventing the loss of filter media during backwashing. (Lisk-FIRL)
W78-11816

TREATMENT OF PRIMARY SEWAGE SLUDGE WITH ENZYMES,
University Coll. of Swansea (Wales). Dept. of Chemical Engineering.
J. S. Knapp, and J. A. Howell.
Biotechnology and Bioengineering, Vol. 20, No. 8, p 1221-1234, 1978. 7 fig, 19 ref.

Descriptors: *Cellulose, *Hydrolysis, *Settling velocity, *Filtration, *Physical properties, Sewage sludge, *Enzymes, Proteins, Yeasts, Fermentation, Resistance, Shear, Waste water treatment, Municipal wastes.

Cellulolysis of primary sewage sludge with an enzyme isolated from Trichoderma viride did not improve the filterability of sludge but did improve the settling characteristics of very dilute sludges. The cellulase preparation was obtained by removing the mycelium from a submerged culture of T. viride. One ml of the enzyme preparation was mixed with 39 ml of primary sewage sludge in all but one experiment where larger volumes were used. The specific resistance to filtration (SRTF) of the cellulase-treated sludges increased sharply within the initial 4-6 hrs of treatment. In some cases, the SRTF gradually returned to that of untreated sludge, while other sludge samples did not regain their original filtration properties even after 24 hrs of treatment. A 30-fold increase occurred in the settling rate of cellulase-treated dilute sludge containing 6 g/liter suspended solids. Settling doubled in treated sludge containing 20-25 g/liter solids. Cellulolysis tripled the settling rate at 50 g/liter solids but only increased the solids concentration by 30%. The protein concentration of the filtrate from the treated sludge increased 5-10 fold, up to 2.4 g/liter protein, and the BOD increased up to 13,000 mg/liter; the filtrate was capable of supporting the growth of yeasts, such as Candida utilis, for the production of single cell protein. The productivity, however, was low and the process was not considered economically feasible at this time. (Lisk-FIRL)
W78-11817

PURE OXYGEN FIXED FILM REACTOR,
Reid, Quebe, Allison, Wilcox and Associates, Inc. Indianapolis, IN.
S-J. Yeh, and C. R. Jenkins.
Journal of the Environmental Engineering Division-ASCE, Vol. 104, No. EE4, p 611-623, August, 1978. 6 fig, 4 tab, 20 ref.

Descriptors: *Trickling filters, *Oxygen, *Activated sludge, *Organic loading, *Capillary action, Carbon, Biochemical oxygen demand, Nitrification, Ammonia, Denitrification, Aerobic treatment, Construction materials, Waste water treatment, Municipal wastes.

Laboratory tests were performed on a continuous-flow aerobic media trickling filter which supplies pure oxygen to the biomass through pressurized, thin capillary walls of Teflon. The studies concluded that the process was capable of accomodating higher organic loads than conventional trickling filters or activated sludge processes. The bench-scale reactor consisted of a 51-mm internal diameter, 1.7-m long Plexiglass pipe containing etched Teflon tubes with wall thicknesses of 0.33-mm, 0.79 mm, and 0.23 mm; upstream tube ends were attached to an oxygen inlet manifold, while the downstream ends were sealed. A synthetic waste water feed, with a BOD concentration of about 200 mg/liter and a pH of 6.15-7.00, was varied according to total organic carbon content over 55, 110, and 165 mg/liter; detention time in the reactor was maintained at 0.5, 1.0, 2.0, and 3.0 hrs for each organic loading. The organic removal efficiency in the reactor increased with detention time, reaching a plateau after about 1 hr at the lowest organic loading; for the other organic carbon concentrations, 2 hrs was considered the optimum detention time for 90% removal. Yield coefficients, dependent upon detention time in the aerobic media filter, were not as high as those conventional or oxygen activated sludge processes, but were comparable to those in high rate trickling filters. Although nitrification occurred along the length of the reactor, the rate decreased as the reactor length increased because of localized denitrification, inhibitory conditions, washout of nitrifying populations, and low ammonia concentrations. The oxygen demand for the filter system ranged over 1.4-2.27 lbs 02/lb BOD removed, to the demand of an oxygen activated sludge system. (Lisk-FIRL)
W78-11818

CITY OF HAMILTON WATER POLLUTION CONTROL PLANT,
Steven and Fitzmaurice, Christchurch (New Zealand).
D. L. Steven.
New Zealand Engineering, Vol. 33, No. 6, p 122-126, June, 1978. 2 fig, 2 ref.

Descriptors: *Treatment facilities, *Screens, *Settling basins, *Aeration, *Aerated lagoons, *Electrolysis, Chlorination, Outfall sewers, Project planning, Reinforced concrete, Construction materials, Equipment, Waste water treatment, Municipal wastes.

The first stage in a three-stage project to develop a municipal waste water treatment plant in Hamilton, New Zealand, involved the construction of primary treatment and chlorination facilities to accommodate an average dry weather flow of 45,500 cu m and installation of a 2,400 mm subfluvial outfall into the Waikato River. The second and third stage plans include the construction of secondary treatment facilities to increase the treatment capacity to 57,000 cu m and doubling the size of both primary and secondary facilities. Sewage flows by gravity through a 1,650 mm reinforced-concrete pipeline to the plant where it is passed through three bar screens each 1,800 mm wide. Screened sewage passes through a standing wave hydraulic control flume and aerated concrete conduits to the grit removal and aeration tanks where it is subjected to about 30 min of aeration at a rate of 0.4 cu m/min/meter tank length. Grit and settled particles are transferred from the tank bottom to hoppers for subsequent cyclone dewatering. Following preaeration, the waste water receives primary settling for about 2.2 hrs in three reinforced-concrete tanks equipped with sludge removal pumps and air jets for removal of surface grease, fat, and scum. Sodium hypochlorite is produced on-site by electrolysis of a brine solution; the waste water is chlorinated in the subfluvial outfall which also acts as a contact basin. The facility also contains two reinforced-concrete sludge digesters and a foul air reclamation system. (Lisk-FIRL)
W78-11819

TERTIARY TREATMENT OF EFFLUENTS BY FILTRATION,
Schumachersche Fabrik, Bietigheim (West Germany).
H. J. Schmidt-Holthausen.
Filtration and Separation, Vol. 15, No. 4, p 350, 352, 367, July-August, 1978. 1 fig, 1 tab.

Descriptors: *Tertiary treatment, *Filtration, *Porous media, *Coatings, *Impervious membranes, Sands, Coals, Diatomaceous earth, Perlite, Waste water treatment, Municipal wastes.

Separating layer filtration, sand filtration, and multi-layer filtration are evaluated and tertiary treatment methods for municipal waste water. Separating layer filtration, utilizing porous media, requires precoating of the filter layer with diatomite or perlite to prevent waste accumulation and filter clogging. Precoating of the filter medium can increase the surface filtration area within a small space, reduce backwash water and compressed air requirements for filter cleaning becuase of a fairly dry slid residue, and provide a chemical reagent for aditional treatment of resistant materials. Incorporating waterproof membranes between the filter layers enhances solis removal. During tertiary treatment, sand fltration requires two or more layers for adequate sludge retention. Tests have indicated that high performance with low resistance and maximum solids deposition can be achieved with a filter containing equal volumes of 1.5-2.5 mm hydro-anthracite and 0.7-1.2 mm quartz sand. A new highly porous media, Hydro-Multifilt, can be arranged in 400-600 mm layer thicknesses without upper layer stratification of fine particles. The round granules have a bulk density of about 640 kg/cu m and an apparent density of approximately 1.03 g/ml. Upflow rather than downflow filtration through a multi-layer filter is not considered as efficient because of the reduced filtration speed and potential breakthrough. (Lisk-FIRL)
W78-11820

AERATED-PILE COMPOSTING: A PROMISING NEW ALTERNATIVE FOR DISPOSING OF SEWAGE SLUDGE,
G. Dallaire.
Civil Engineering-ASCE, Vol. 48, No. 9, p110-117, September, 1978. 3 fig, 3 tab, 10 ref.

Descriptors: *Sludge digestion, *Sludge treatment, *Biodegradation, *Heat treatment, *Aeration, Wood waste, Pipes, Fertilizers, Microbial degradation, Soil amendments, Capital costs, Moisture content, Sludge disposal, Waste water treatment, Municipal wastes.

The United States Department of Agriculture's research center in Beltsville, Maryland, has developed an aerated-pile composting technique for digesting raw sewage sludge. The raw sludge is initially dewatered to about 22% solids content with a centrifuge, belt filter press, or vacuum filter; the solids content is further increased by mixing the sludge with woodchips. The mixture is then applied to a bed of woodchips which cover a suction aeration system. The compost pile is covered with a 1-ft insulating blanket of woodchips of compost. The aeration system draws air, heat, and moisture down through the compost pile to the suction pipe system. Within the first 3-5 days of composting, internal temperatures reach 80C, sufficient for destroying most pathogens. After 21 days of composting, the material is spread in thin layers or in windows for drying. The compost may also be piled, unaerated, for 30 days of curing if inclement weather conditions exist. If the compost is dried, the material is then screened to remove the woodchips and cured for 30 days; if the compost is initially cured, the material is then dried and screened. The use of aerated extended piles, in which piles are placed adjacent to one another and covered with a continuous layer of insulation, can reduce expenditures for land and woodchips. High heavy metal concentrations, especially cadmium, in the compost may render the material unsuitable for agricultural fertilizer. A composting system treating 10 dry tons sludge/day has an estimated capital cost of $376,200 and an annual operating cost of about $185,800. (Lisk-FIRL)
W78-11821

AIR-POLLUTING EFFECT OF ACTIVATED-SLUDGE WASTEWATER TREATMENT PLANTS (ELEVENISZAPOS SZENNYVIZTISZTITOK LEVEGOSZENNYEZO HATASA),
For primary bibliographic entry see Field 5A.
W78-11822

THE USE OF COAGULANTS IN PRIMARY SEDIMENTATION OF SEWAGE,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Civil Engineering and Building Technology.
F. H. Al-Momen, and H. Willis.
Public Health Engineer, Vol. 6, No. 3, p 179-181, 1978. 3 fig, 1 tab, 10 ref.

Descriptors: *Coagulation, *Chemical precipitation, *Domestic wastes, *Iron compounds, *Suspended solids, Biochemical oxygen demand, Filtration, Sludge treatment, Dewatering, Capillary action, Chlorides, Sulfates, Settling basins, Separation techniques, Waste water treatment, Municipal wastes.

Coagulation of primary domestic sewage with ferric chloride, aluminum sulfate, and aluminum chloride was evaluated in jar and laboratory settling column tests with respect to effluent suspended solids, BOD, and sludge filterability. Coagulant doses of 50, 100., 150, and 200 mg/liter were applied to effluent samples containing mean suspended solis concentrations of 165, 215, 256, and 362 mg/liter. An effective dose of 100-150 mg/liter ferric chloride reduced suspended solids by 80-90% and BOD by an average of 80%; this dosage also increased the capillary suction time of the sludge by a factor of 5.22 and produced a sludge with a moisture content of 99.34%. Aluminum sulfate, in an optimum dose range of 200-250 mg/liter, reduced suspended solids by 60 80% and BOD by 75%; it also increased sludge capillary suction time by a factor of 3.85, and produced a sludge with 99.25% moisture content. An effective dose of 100-150 mg/liter aluminum chloride resulted in an 85-90% decrease in suspended solids and an 80% decrease in BOD; it also increased capillary suction time by a factor of 4.19 and produced sludge with a moisture content of 99.30%. Sludge volumes more than doubled with all coagulants tested; effluent pH averaged between 7.20 and 7.50. Ferric chloride was considered the most effective coagulant of those evaluated. (Lisk-FIRL)
W78-11823

GRANULAR MEDIA FILTRATION OF SECONDARY EFFLUENT,
Central Weber Sewer Improvement District, Ogden, UT.
M. M. Dawda, M. L. Davidson, and E. J. Middlebrooks.
Journal Water Pollution Control Federation, Vol. 50, No. 9, p 2143-2156, September, 1978. 7 fig, 10 tab, 10 ref.

Descriptors: *Filtration, *Tertiary treatment, *Sands, *Coals, *Pilot plants, Treatment(Facilities), Chlorination, Hydraulic design, Biochemical oxygen demand, Suspended solids,

Nutrients, Design criteria, Filters, Waste water treatment, Municipal wastes.

A dual-media tertiary filter was tested in pilot studies at the Central Weber waste water treatment plant near Ogden, Utah, as a method of polishing secondary effluent to within BOD and suspended solids standards. The SVG filter, supplied by Envirotech Corp., consisted of a 4-ft diameter tank containing a filter compartment with one ft of anthracite coal at an effective size of 1.00-1.10 mm, overlying a one ft layer of sand with a 0.45 mm effective size; the coal and sand had an uniformity coefficient of 1.7. Hydraulic loadings of 3, 4, 5, and 6 gal/min/sq ft with automatic filter backwashing were employed. One filter cycle, 16-, 18-, 20-, and 24-hr composite samples were analyzed for BOD, suspended solids, nitrates, nitrites, ammonia, and total and orthophosphates. During summer months, chlorine had to be added to the influent to maintain a chlorine residual adequate for inhibiting the growth of Sphaerotilus which clogged the filter media. At a hydraulic loading of 3 gal/min/sq ft, filtered effluent containing less than 10 mg/liter BOD and suspended solids was produced; although this loading was considered optimum for effluent quality, a loading of 5 gal/min/sq ft was considered more economical. Smaller, more uniform media enhanced effluent quality and influenced the filter cycle duration. Chemical filtration aids, such as aluminum sulfate and cationic polymers with alum, significantly reduced the filter cycles; jar tests of coagulation aids were recommended before implementation. (Lisk-FIRL)
W78-11824

ULTRAFILTRATION MEETS DISCHARGE REGULATIONS AND REDUCES WASTE PUMPOUT,
David W. Taylor Naval Ship Research and Development Center, Annapolis, MD.
L. R. Harris, P. Schatzberg, D. Bhattacharyya, and D. F. Jackson.
Water and Sewage Works, Vol. 125, No. 8, p66-71, August, 1978. 6 fig, 7 tab, 7 ref.

Descriptors: *Membrane processes, *Filtration, *Domestic wastes, *Semipermeable membranes, *Coliforms, Suspended solids, chemical oxygen demand, Tubes, Filters, Pressure, Waste water treatment, Ships.

Ultrafiltration membrane treatment of domestic sewage from marine vessels was evaluated as a method for treatment to within the stricter discharge standards of 150 mg/liter suspended solids and 200 coliforms/100 ml. An ultrafiltration module containing seven 1-inch diamter noncellulosic tubular membranes arranged in parallel, was used to treat several combinations of wastes including raw sewage and wastes from the galley, laundry, and shower areas. The module was operated in a semi-continuous mode at a pressure of 40 lb/sq inch and a circulation rate of 30 gal/min; a batch concentration pump-down mode was also tested with six modules in series, operated at the same circulation rates and pressure. At a food temperature of 80 F, raw sewage exhibited the lowest flux decline slope while galley wastes displayed the highest; higher initial fluxes resulted in high final fluxes after processing mixed wastes. The pump-down phase utilizing new membranes recovered 90% of the water after 15 hrs of processing, achieving a membrane flux of 60 gal/sq ft/day. When the feed temperature was increased to 130 F, the average flux increased, decreasing the flux decline slope: an average flux of 58 gal/sq ft/day was obtained at a feed temperature of 100 F. Membrane performance for the various waste parameters encompassed 61.5-91.0% removal of COD, 89.5-99.3% rejection of suspended solids, and more than 99% reduction of fecal coliforms. The use of a 200 mg/liter hypochlorite solutin to wash the membrane restored flux reasonably well and was considered more convenient than an enzyme-detergent wash. Total operating costs for a prototype ultrafiltration system were calculated at $2.99/1000 gal. (Lisk-FIRL)
W78-11825

RAW SEWAGE TREATMENT AT DEER CREEK PARK,
Ohio Agricultural Research and Development Center, Wooster. Dept. of Angronomy.
S. S. Brar, and R. H. Miller.
Ohio Report, Vol, 63, No. 4, p57-59, July-August, 1978. 2 fig, 3 tab.

Descriptors: *Oxidation lagoons, *Application methods, *Chlorination, *Return flow, *Spray irrigation, Sewage lagoons, Soybeans, Alfalfa, Grasses, Storage tanks, Camp sites, Parks, Waste water treatment, Domestic wastes.

An oxidation lagoon-land application pilot plant was constructed at the Deer Creek State Park in Pickaway County, Ohio, to treat raw sewage from 232 campsites. Sewage was pumped to the stabilization pond for treatment, followed by chlorination in a storage tank, and spray irrigation onto 3-acre plots of reed canarygrass, soybeans, alfalfa, and tree seedlings. Samples were collected from the raw sewage, stabilization pond effluent, storage tank waste water, surface runoff, drainage water, and test wells in and near the land application sites. The stabilization pond reduced BOD by 85% and fecal coliforms by 99.9%; carbonate formation and increased pH, resulting from carbon dioxide uptake by blue-green algae in the pond, caused the precipitation of calcium and magnesium and decreased water hardness. Total phosphorus was reduced to 0.4 mg/liter and total nitrogen to 4.6 mg/liter in stabilization and pond effluent; further decreases in nutrient levels were observed in holding tank effluent and drainage water samples. Although effective treatment was obtained with the pilot system, it was noted that low usage of the camp sites during the study period resulted in atypical raw sewage characteristics. (Lisk-FIRL)
W78-11826

OZONATION IN A WASTEWATER REUSE SYSTEM: EXAMINATION OF PRODUCTS FORMED,
Cincinnati Univ., OH. Environmental Health Engineering.
V. J. Elia, C. S. Clark, K. T. McGinnis, T. E. Cody, and R. N. Kinman.
Journal Water Pollution Control Federation, Vol. 50, No. 7, p 1727-1732, July, 1978. 5 fig, 1 tab, 17 ref.

Descriptors: *Ozonation, *Water reuse, *Tertiary treatment, *Ozone, *Reverse osmosis, *Pollutant identification, Gas chromatography, Organic compounds, Oxidation, Chemical reactions, Chemical oxygen demand, Water analysis, Hospitals, Toxicity, Bioassay, Analytical techniques, Disinfection, Waste water treatment.

The Kettering Laboratory of the University of Cincinnati in Ohio initiated experiments to examine the characteristics of water treated by a direct reuse system. The system was designed to treat raw wastes from five sources within a mobile surgical hospital, using ultrafiltration, reverse osmosis, and ozonation. A synthetic reverse osmosis permeate having a strength equivalent to 8 times that expected in a conventional hospital waste stream was contacted in a plexiglass chamber with 50 m/liter ozone; a gas flow rate of 6.2 liters/min, feedwater flow rates of 18.9-56.7 liters/hr, and ozonation times of 18-193 min were employed. After 193 min of ozonation, total organic carbon (TOC) and COD were reduced by 28 and 31%, respectively; ozonation produced acetone, acetaldehyde, and acetic acid. Concentrations of methanol, ethanol, and isopropanol were reduced by 70, 95, and 99%, respectively, during the first 60 min of ozonation. Additional studies examined the cytotoxicity of the ozonated samples using a mammalian cell culture bioassay system. Measured TOC values were significantly higher than calculated values, suggesting that all the oxidation products had not been identified. Further studies on the effects of oxidation products in a closed-cycle direct water reuse system were recommended. (Schulz-FIRL)
W78-11828

WIDER USE OF SEWAGE SLUDGE.
Effluent and Water Treatment Journal, Vol. 18, No. 7, p 311, 313, July, 1978.

Descriptors: *Sewage sludge, *Sludge disposal, *Dewatering, *Application methods, *Centrifugation, Sludge digestion, Model studies, Simulation analysis, Crop response, Transport, Ultimate disposal, Anaerobic digestion, Waste water treatment, Sludge treatment, Municipal wastes.

England's Water Research Center has developed a technique to evaluate the thickening properties of sewage sludges. A low speed centrifuge accelerates the sludge settling process and simulates the thickener's compressive force. Subjecting a sludge sample in a 10-cm tube to 20 min of gravitational acceleration is equivalent to 3.5 hrs of thickening in a 200-cm deep tank. The technique was developed during investigations into the agricultual applicaton of sewage sludge to plants. To reduce transport costs, it was necessary to increase sewage with 5% solids contents to 12% solids; the thickening analysis was also applied to laboratory studies on anaerobic digestion of sludges. The Center is evaluating the effects of applying three of undigested sludge and one lagooned sludge to agricultural crops for a 2-yr period. (Lisk-FIRL)
W78-11830

FLOW AND LOAD VARIATIONS IN TREATMENT PLANT DESIGN,
Iowa State Univ., Ames. Dept. of Civil Engineering.
J. C. Young, J. L. Cleasby, and E. R. Baumann.
Journal of the Environmental Engineering Division-ASCE, Vol. 104, No. EE2, p289-303, April, 1978. 13 fig, 2 tab, 20 ref.

Descriptors: *Hydraulic design, *Design criteria, *Organic loading, *Treatment facilities, *Peak loads, Infiltration, Peaking capacity, Peak discharge, Biochemical oxygen demand, Ammonia, Waste water treatment, Municipal wastes.

Waste water flow and loading patterns at the Ames, Iowa, treatment plant were studied as a means of incorporating peak flow and load variations into the design of biological treatment plants. With an increase in population over the last 22 yrs, the organic loading on the plant has increased from an average 4,050 to 6,690 lbs/day BOD and from 3,655 to 7,396 lbs/day suspended solids. Flow rates to the plant peaked during spring months due to infiltration; the peak-month flow rate averaged 135% and the peak-day flow rate was about 191% of the annual flow rate. Peak 8-hr and 4-hr flow rates averaged 229% and 237%, respectively, of the annual average. From these parameters, it was estimated that biological treatment units should be designed to accommodate BOD loads of 1.3 times the average annual load and ammonia loads of 1.25 times the average annual load. Design oxygen supply rates were calculated as a function ofthe peak daily BOD and ammonia loads plus 50% of the peak 4-hr load rate. Design criteria was also developed for the final clarifiers, the surface settling rate, and the solids load. (Lisk-FIRL)
W78-11831

ACCUMULATION RATE AND CHARACTERISTICS OF SEPTIC TANK SLUDGE AND SURFACE,
Ontario Ministry of the Environment, Toronto.

M. Brandes.
Journal Water Pollution Control Federation, Vol. 50, No. 5, p 936-943, May, 1978. 7 tab, 11 ref.

Descriptors: *Septic tanks, *Sewage sludge, *Cleaning, *Domestic wastes, *Chemical analysis, Organic wastes, Degradation(Decomposition), Analytical techniques, Volumetric analysis, Waste water treatment, Sludge disposal, Municipal wastes.

The impact of septic tank capacity and waste water strength on the accumulation rate and the chemical and biological sludge characteristics was evaluated in three septic tanks with different capacities and influent volumes over a 2-yr period. The chemical and bacteriological properties of the sludge and septage were dependent upon the strength of the waste water and the detention time in the tank. The 3,410 liter tank, treating toilet wastes, had a detention time of 9.7 days; the 4,590 liter tank, treating additional bathroom and kitchen wastes, had a detention time of 24 days; and the 8,980 liter tank, treating bathroom, kitchen, and laundry wastes, maintained effluent for 1.9 days. Septage was found to accumulate in the tanks at a rate of 200 liters/capita/yr. Longer detention times enhanced decomposition of organic matter and solids removal. Permissible time intervals between cleanings were calculated as 8.08 yrs for the small tank, 2.89 yrs for the medium tank, and 1.44 yrs for the large tank; health regulations required that the small size tank be cleaned every 4.2 yrs. (Lisk-FIRL)
W78-11832

BIOCHEMICAL OXYGEN DEMAND PROGRESSION IN MIXED SUBSTRATES,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-11833

A NOMOGRAM FOR THE DETERMINATION OF AMMONIA IN WASTEWATER BY A KNOWN ADDITION TECHNIQUE,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Applied Chemistry Labs.
For primary bibliographic entry see Field 5A.
W78-11835

METHODS FOR CHECKING THE OPERATION OF ACTIVATED-SLUDGE WASTEWATER TREATMENT PLANTS AND FOR DETERMINING DESIGN CRITERIA FOR NEW TREATMENT FACILITIES (MODSZEREK ELEVENISZAPOS SZENNYVIZTISZTITO TELEPEK UZEMENEK ELLENORZESERE, UJ TELEPEK TERVEZESI ADATAINAK A MEGHATAROZASARA),
Fovarosi Csatornazasi Muvek, Budapest (Hungary).
W. Fleps, T. Pal, and M. Szilagyi.
Hidrologiai Kozlony, No. 4, p 166-173, 1978. 1 fig, 5 tab, 5 ref.

Descriptors: *Activated sludge, *Instrumentation, *Oxygen demand, *Respiration, *Suspended solids, Chemical oxygen demand, Optimization, Measurement, Pilot plants, Analytical techniques, Waste water treatment, Municipal wastes.

A flow-through respirometer measured the impact of increased aeration basin retention time, increased activated sludge concentration, and effluent suspended solids concentration on the COD removal efficiency of a Hungarian waste water treatment plant. The respirometer contained a flow-through reactor and settling tank, a gas scrubbing flask, an oxygen burette, feed valves, a graduated cylinder for collecting treated effluent, and a peristaltic pump for introducing raw sewage from the holding tank into the reactor. When the retention time in the aeration basin was increased from 2 to 4 hrs, COD removal only increased from 61.6 to 62.1%; COD removal decreased from 62.6 to 50.0% and unit oxygen demand increased from 58 to 70 mg/liter when the activated sludge concentration increased from 3.0 to 5.0 g/liter. Effluent suspended solids levels averaged 43 mg/liter over a 24 hr period; this high concentration, as well as high diurnal COD concentrations in industrial wastes discharged to the plant, were considered the causes of poor COD removal efficiency. Respirometer, pilot plant, and full-scale tests indicated that doubling the aeration basin retention time would reduce COD by 76-78% and suspended solids by 89-90%. (Lisk-FIRL)
W78-11837

THE OCCURRENCE OF AEROMONADS IN ACTIVATED SLUDGE: ISOLATION OF AEROMONAS SOBRIA AND ITS POSSIBLE CONFUSION WITH ESCHERICHIA COLI,
Swedish Water and Air Pollution Research Lab., Stockholm.
For primary bibliographic entry see Field 5A.
W78-11838

DEVELOPMENT OF QUANTITATIVE METHODS FOR THE DETECTION OF ENTEROVIRUSES IN SEWAGE SLUDGES DURING ACTIVATION AND FOLLOWING LAND DISPOSAL,
Baylor Coll. of Medicine, TX. Dept. of Virology and Epidemiology.
For primary bibliographic entry see Field 5A.
W78-11839

A MORE ECONOMICAL METHOD FOR THE DETERMINATION OF CHEMICAL OXYGEN DEMAND,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W78-11840

REGULAR TESTING CAN CONTROL HYDROGEN SULFIDE,
FMC Corp., San Jose, CA.
For primary bibliographic entry see Field 5A.
W78-11841

ANTIBIOTIC RESISTANCE PATTERN OF SALMONELLA WELTEVERDEN STRAINS ISOLATED FROM MAN, ANIMALS, SEWAGE AND WATER,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Coll. of Veterinary Medicine.
For primary bibliographic entry see Field 5A.
W78-11842

DETERMINATION OF ORGANOSILICONE IN SEWAGE SLUDGE BY ATOMIC ABSORPTION SPECTROMETRY, (IN JAPANESE).
Ajinomoto Co., Inc., Kanagawa (Japan). Central Research Labs.
For primary bibliographic entry see Field 5A.
W78-11844

TOXICITY-TEST ON FISH CARASSIUS AURATUS IN WATERS AND SEWAGES CONTAINING PHENOL, TREATED WITH NACLO OR WITH CLO2 (IL TEST DI ITTIOTOSSICITA' SU ACQUE E LIQUAMI DEPURATI CON IPOCLORITO E BIOSSIDO DI CLORO, IN PRESENZA DI FENOLO),
Naples Univ. (Italy). Dept. of Hygiene and Science.
For primary bibliographic entry see Field 5A.
W78-11845

SIGN-OF-CHARGE OF SPECIES OF CU, CD AND ZN EXTRACTED FROM SEWAGE SLUDGE, AND EFFECT OF PLANTS,
Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5A.
W78-11846

H2-PRODUCING BACTERIA IN DIGESTING SEWAGE SLUDGE ISOLATED ON SIMPLE, DEFINED MEDIA,
North Dakota State Univ., Fargo. Dept. of Bacteriology.
For primary bibliographic entry see Field 5A.
W78-11847

DEEP SHAFT.
Consulting Engineer, Vol 42, No 7, p 43, July, 1978.

Descriptors: *Deep wells, *Biological treatment, *Hydraulic equipment, *Plastics, *Shafts(Excavations), Industrial wastes, Corrosion control, Equipment, Treatment facilities, Chlorides, Waste water treatment, Municipal wastes.

The deep shaft biological treatment system installed in England's Marsh Farms treatment plant treats both industrial and municipal wastes. The high chloride content of the waste water required that the 130 m deep shaft unit's downcomer be constructed of corrosion-resistant fiberglass-reinforced plastic. The deep shaft is 2 m in diameter, with a large bell-mouthed T-piece to distribute waste water to the downcomer. The downcomer hangs freely in the shaft and is constructed to withstand 30 yrs of services; the downcomer must have high mechanical strength and precision alignment in the shaft for efficient waste water treatment. (Lisk-FIRL)
W78-11848

MIXING FIXED-SPEED PUMPS TO VARIABLE FLOWS,
Dillon (M. M.) Ltd., London (Ontario).
For primary bibliographic entry see Field 8C.
W78-11849

SECONDARY CLARIFIER WITH A DIFFERENCE.
Consulting Engineer, Vol 42, No 7, p 41, July, 1978.

Descriptors: *Settling basins, *Hydraulic equipment, *Intakes, *Outlets, *Channels, Sludge disposal, Overflow, Skimming, Equipment, Hydraulic design, Waste water treatment, Municipal wastes.

The Rim Flo secondary clarifier is equipped with both feed and decanting channels at the periphery of the tank and a suction header sludge removal unit. The clarifier was designed by Envirex Inc. and is distributed in England by Paterson Candy International. The design of the clarifier reportedly permits greater waste water volumes, higher overflow rates, maximum hydraulic stability, full surface skimming, and lower construction costs than conventional clarifiers with central feed well units. Clarifiers that have been converted to the peripheral channel configuration have accommodated greater volumes without tank expansion. The Rim Flo is also equipped with a rotary suction tube containing specifically sized and spaced outlets for a sludge removal. The central shaft of the rectangular, tapered suction tube runs parallel to the base of the clarifier and can remove low density sludges or provide rapid sludge removal. (Lisk-FIRL)
W78-11850

AUTOMATIC CONTROL OF THE ACTIVATED SLUDGE PROCESS-I. DEVELOPMENT OF A SIMPLIFIED DYNAMIC MODEL,
Exxon Co., Baytown, TX.
R. F. Lech, H. C. Lim, C. P. L. Grady, Jr., and L. B. Koppel.
Water Research, Vol 12, No 2, p 81-90, 1978. 7 fig, 3 tab, 21 ref.

Descriptors: *Activated sludge, *Mathematical models, *Model studies, *Dynamics, *Kinetics, Settling basins, Biological treatment, Growth rates, Organic load, Suspended solids, Waste water treatment, Municipal wastes.

Mathematical models were developed to describe the dynamic behavior of primary settlers, biological reactors, and final settlers in the activated sludge process. Steady state mass balances were calculated for flow rate, soluble organics concentration, and suspended solids concentration in the primary settler. The values were applied to a model depicting solids removal as a function of the underflow stream parametes or the overflow rate. Models were also developed for the degree of thickening in the settler, the effect of influent suspended solids concentration and influent flow rate, and the effluent soluble substrate concentration. In the biological reactor, the concentration of the influent substrate was the sum of the soluble and suspended substrate leaving the primary settler; the specific microbial growth rate was calculated as a function of the surrounding substrate using Monod's equation. Models also described the net rate of biomass production, the true growth yield, the material balances for live cells and substrate, the concentration of the mixed liquor suspended solids, and the recycled sludge concentration. Several models were evaluated for calculating the effluent suspended solids concentration in the final settler; transfer functions for the biological reactor incorporated dead time and steady-state gain parameters. (Lisk-FIRL)
W78-11851

AUTOTROPHIC DENITRIFICATION USING ELEMENTAL SULFUR,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
B. Batchelor, and A. W. Lawrence.
Journal Water Pollution Control Federation Vol 50, No 8, p 1986-2001, August, 1978. 9 fig, 8 tab, 24 ref, 1 append.

Descriptors: *Denitrification, *Nitrates, *Sulfur, *Bacteria, *Model studies, Kinetics, Mathematical models, Flocculation, Settling velocity, Cost analysis, Waste water treatment, Municipal wastes.

The kinetic, stoichiometric, and solids separation properties of an autotrophic denitrification process employing Thiobacillus denitrificans were evaluated in five continuous-culture, anaerobic slurry reactors using elemental sulfur. Steady-state stoichiometric reactions and nitrate removal were calculated for various solids retention time; the maximum denitrification rate was then determined for ratios of elemental sulfur to biomass ranging over 45-194 mg/mg nitrate-nitrogen. A series of zone settling velocity and flocculant settling tests were conducted at several elemental sulfur concentrations. The observed biomass yield remained fairly constant within a range of growth rates, elemental sulfur-to-biomass values, and temperatures, indicating negligible microbial decay; a stoichiometric equation for autotrophic denitrification was derived from the average observed biomass yield and an empirical cell mass formula. Under steady-state conditions, the continuous flow reactors achieved about 99.5% nitrate removal. The maximum unit rate of denitrification was a linear function of the sulfur-to-biomass concentration ratio; the influence of temperature was described by the Arrhenius equation. Within the lower ranges of sulfur-to-biomass, smaller solid fluxes were produced; the solids flux was linearly related to the sulfur-biomass slurry solids level. The effluent suspended solids concentration was proportional to the overflow rate. (Lisk-FIRL)
W78-11852

KINETIC PARAMETERS AND RELATIVE TURNOVERS OF SOME IMPORTANT CATABOLIC REACTIONS IN DIGESTING SLUDGE,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
H. F. Kaspar, and K. Wuhrmann.
Applied and Environmental Microbiology, Vol. 36, No. 1, p 1-7, July, 1978. 4 fig, 4 tab, 24 ref.

Descriptors: *Sludge digestion, *Anaerobic bacteria, *Methane, *Hydrogen, *Oxidation, Kinetics, Anaerobic digestion, Organic wastes, Microbial degradation, Hydrolysis, Model studies, Saturation, Waste water treatment, Municipal wastes.

The kinetics of fatty acid degradation, methanogenesis by acetate splitting, and lithotrophic methane generation were evaluated in laboratory-scale anaerobic digesters. Under steady-state conditions, the initial acetate concentration averaged 0.26 millimoles/liter with an average degradation rate of 0.27 millimoles/liter/hr; the acetate concentration was then increased to 1-2 millimoles/liter with sodium acetate under conditions of system saturation. Acetate degradation increased by 56% at saturation with a maximum degradation rate of 0.63 millimoles/liter/hr; the half-saturation concentration averaged 0.32 millimoles. Under steady-state conditions, the propionate concentration was less than 0.02 millimoles/liter with a degradation rate averaging 0.03 millimoles/liter/hr; at system saturation, propionate removal averaged 0.19 millimoles/liter/hr, attaining a maximum of 0.233 millimoles/liter/hr and a half-saturation concentration of 0.094 millimoles/liter. Hydrogen removal comprised less than 1% of the maximum potential degradation rate. Acetate splitting was considered the rate-limiting factor in anaerobic digestion. The unused hydrogen consumption capacity acted as a buffer for dissolved hydrogen partial pressures low enough for exergonic oxidation of fatty acids. Bacteria capable of anaerobic fatty acid oxidation and hydrogen generation were considered essential in methane-forming ecosystems. (Lisk-FIRL)
W78-11853

DYNAMICS AND CONTROL OF THE ACTIVATED SLUDGE WASTEWATER PROCESS,
Diamond Shamrock Co., Painesville, OH.
U. Attir, and M. M. Denn.
AIChE Journal, Vol. 24, No. 4, p 693-698, July, 1978. 8 fig, 2 tab, 11 ref, 1 append.

Descriptors: *Dynamic programming, *Model studies, *Activated sludge, *Settling basins, *Simulation analysis, Control systems, Sewage sludge, Underflow, Recycle, Performance, Mathematical models, Systems analysis, Waste water treatment, Municipal wastes.

Dynamic modelling of the reactor and the settling basin in an activated sludge system established a control strategy in which the settler underflow and recycle rates were maintained at a constant ratio with respect to the feed flow rate. The reactor model described the BOD and solids concentration in the reactor volume in terms of the volumetric flow rates, feed concentration, recycle stream, stoichiometric yield factor, and the reaction rate; the organism growth rate at a steady state in the reactor followed the Monod equation. Steady state modelling of the solids flux in the settler was based on a curve encompassing convective, gravity, and total fluxes. The settler was divided into zones of clarification, thickening, and compaction; concentration layers between the thickening and compaction zone were described by mass balance equations and the velocity of solids discontinuity. The response of settlers to two-step alterations in feed rate and to 24 hr cyclic feeds was simulated; underloading was found to destroy the buffering action of the sludge blanket and render the system unable to adequately resume steady state conditions. A compromise between controlling the sludge blanket level in the settler and the reactor solids concentration was reached by computing the optimum settler underflow rate for each feed rate and maintaining a constant underflow-to-feed rate ratio. (Lisk-FIRL)
W78-11854

HYDRAULIC ANALYSIS OF MODEL TREATMENT UNITS,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
F. L. Hart, and S. K. Gupta.
Journal of the Environmental Engineering Division-ASCE, Vol. 104, No. EE4, p 785-798, August, 1978. 9 fig, 6 tab, 15 ref, 1 append.

Descriptors: *Model studies, *Tracers, *Fluorescent dye, *Hydraulic design, *Prototypes, Froude number, Reynolds number, Mathematical models, Analytical techniques, Design criteria, Tracking techniques, Prototype tests, Chlorination, Waste water treatment, Municipal wastes.

A technique incorporating dye tracing procedures was applied to a model chlorine contact chamber to provide design criteria for optimum treatment unit configuration. For a model or prototype unit with a fixed length scale and actual prototype flow, the required model flow was varied to obtain a tracer output paralleling the prototype response. For a prototype with a flow rate of 8.6 mgd, the required model flow with equal detention times was calculated at 10 gal/min; when designed according to the Froude number or the Reynolds number, the required flow was calculated as 29 gal/min or 710 gal/min, respectively. For a model with a 142 gal volume and a scale ratio of 1:8.43, the recovery of a fluorescent dye injected in the influent was measured with a fluorometer; the model flow rate was varied over 6.4-40.0 gal/min. Based on dye curve variations in the model and comparison of the relative magnitudes of model and prototype dye curves, a flow of 6.4-19.0 gal/min produced parameters closely correlated to the model performance. Thus, the design flow rate calculated by the data similitude technique was significantly lower than those rates recommended by the Froude or Reynolds numbers. The mean detention time index, the dead space fraction, the plug flow, the standard detention efficiency, and the fraction dead volume adequately simulated prototype performance. (Lisk-FIRL)
W78-11855

DESIGN 'EFFECTIVE' COST-EFFECTIVE SYSTEMS,
C. M. Lee.
Water and Wastes Engineering, Vol. 15, No. 7, p 66-68, 70, 72, July, 1978. 2 fig, 4 tab.

Descriptors: *Design criteria, *Cost analysis, *Treatment facilities, Economics, *Performance, Cost comparisons, Analytical techniques, Constraints, Annual costs, Research and development, Regional economics, Model studies, Alternate planning, Forecasting, Project planning, Water quality, Waste water treatment, Municipal wastes.

A five-step cost-effective analysis scheme was developed for designing and constructing municipal waste water treatment plants. The collection of baseline reference data in the first step provides an outline of project objectives, limitations and constraints, quality standards, and service loads; this information from local, regional, and state resources is interpreted into objectives for the individual waste treatment project. The second step defines the potential type of service load, operating schemes, and alternative configurations

capable of achieving planning objectives. In the third step, mathematical cost-effective models simulate waste water treatment processes and predict system performance under various waste streams, time patterns, and operating constraints. From the models, the measure of effectiveness is evaluated for each treatment configuration and operating performance is predicted during regular and peak flow periods. Environmental, investment, annual operating, and research and development costs are then applied. Threshold levels for cost, effectiveness, and environmental impact are employed in step four to evaluate each alternative; the optimization of these threshold values is achieved through sensitivity analysis and trade offs. Treatment processes, cost, and configurations are manipulated to form the optimum threshold configuration. Once the alternative configuration has been decided, step five provides documentation of all design specifications. (Lisk-FIRL)
W78-11856

NITRIFICATION AND ALKALINITY RELATIONSHIPS IN ACTIVATED SLUDGE,
Virginia State Dept. of Health, Lexington.
R. W. Benninger, and J. H. Sherrard.
Journal Water Pollution Control Federation, Vol. 50, No. 9, p 2132-2142, September, 1978. 9 fig, 4 tab, 8 ref.

Descriptors: *Nitrification, *Alkalinity, *Activated sludge, *Model studies, *Nitrates, Ammonia, Nitrogen, Chemical oxygen demand, Design criteria, Laboratory tests, Analytical techniques, Waste water treatment, Municipal wastes.

Alkalinity destruction during nitrification and factors influencing the oxidation of ammonia were investigated in laboratory-scale activated sludge systems, operated under steady state conditions with influent COD-to-total Kjeldahl nitrogen (TKN) ratios of 6.5:1 and 4.2:1. From nitrification reactions, stoichiometric calculations indicated that 7.14 mg alkalinity/liter were destroyed and 4.57 mg/liter 02/liter were required to oxidize 1 mg ammonia/liter to nitrate-nitrogen. The activated sludge reactors were operated at several mean cell residence times up to 15.2 days. Mathematical models were derived for the minimum aeration time required to sustain nitrification, the mean cell residence time, and the observed yield coefficient. Greater mean cell residence times reduced TKN, ammonia, and alkalinity; larger COD:TKN ratios at a specific residence time also improved nitrification. Longer residence times also reduced TKN in the sludge, reduced waste sludge production, and increased the nitrate content of the effluent; higher influent COD:TKN ratios reduced effluent TKN, ammonia, and nitrate levels. The ratio of alkalinity destroyed to TKN removed increased at longer residence times and lower COD:TKN ratios. The stoichiometric value initially calculated for alkalinity destruction proved to be higher than observed. TKN and ammonia were completely removed and COD reduced by 91.1% after 15.2 days at an influent COD:TKN ratio of 6.61:1. (Lisk-FIRL)
W78-11857

MATHEMATICAL MODELS OF BIOLOGICAL WASTE TREATMENT PROCESSES FOR THE DESIGN OF AERATION TANKS,
Akademiya Nauk SSSR, Moscow. Inst. Vodnykh Problem.
V. A. Vavilin, and V. B. Vasilyev.
Water Research, Vol. 12, No. 7, p 491-501, 1978. 8 fig, 1 tab, 32 ref.

Descriptors: *Activated sludge, *Kinetics, *Aerated lagoons, *Mathematical models, *Storage, Biodegradation, Oxidation, Organic loading, Physicochemical properties, Absorption, Adsorption, Flocculation, Model studies, Optimization, Control, Waste water treatment, Municipal wastes.

Formal activated sludge process models which incorporated pollutant sorption by activated sludge flocs, as well as biooxidation, were developed for designing aeration tanks and stabilization tanks in completely-mixed and plug-flow systems. The reactor kinetics of organic matter consumption and activated sludge growth as described by Monod's equation were considered too general and limited to describe microbial growth and decay rates, the impact of growth rate saturation on substrates, and process inhibition by high organic loading and metabolic products. Nonlinear models describing biooxidation kinetics were presented for plug-flow, completely-mixed, and multiple-step aeration tanks; optimization of process kinetics for varying substrate characteristics was considered dependent upon the hydrodynamic regime of mixing within the aeration tank. Evaluation of process kinetics, using theoretical process parameter values, by the Monod equation and its derivatives concluded that sorption of organic materials by activated sludge was a significant factor not included in the kinetic models. Differential equations, which incorporated the total suspended solids concentration without stored substrate and the sorbed pollutant concentration, were developed to include the oxidation of stored substrate on and in the sludge flocs within the stabilization tank. Models incorporating sorbed substrate were developed for several activated sludge process control configurations. (Lisk-FIRL)
W78-11858

PHASE SEPARATION OF ANAEROBIC STABILIZATION BY KINETIC CONTROLS,
Westvaco Corp., Covington, VA.
M. L. Massey, and F. G. Pohland.
Journal Water Pollution Control Federation, Vol. 50, No. 9, p 2204-2222, September, 1978. 16 fig, 5 tab, 17 ref.

Descriptors: *Anaerobic digestion, *Acid bacteria, *Methane bacteria, *Mathematical models, *Kinetics, Fermentation, Acids, Volatility, Model studies, Growth rates, Biomass, Separation techniques, Waste water treatment, Municipal wastes.

Examination of process kinetics of the acid and methane fermentation phases of anaerobic stabilization indicated that phase separation improved process stability and control and reduced the total required reactor volumes. Utilizing the continuous growth theory, mathematical models for both the acid and methane phase reactors described the specific growth rates of acid or methane formers, the concentrations of formers in the effluent, and the available substrate concentration. A retention time of 32.7 hrs or less in the acid reactor enhanced substrate conversion to volatile acids but inhibited the growth of methane-forming organisms and the utilization of volatile acids; the methane reactor retention times were varied over 46.9-133.9 hrs in three tests. Organic carbon in the acid reactor was primarily converted to acetic acid and propionic acid; the concentration of propionic acid exceeded that of acetic acid after 24 hrs retention. Although gravity settling and biomass recycling in the acid reactor enhanced process operation, the same procedure was not feasible in the methane reactor because of the poor settling properties of the biomass solids. In the acid phase, the kinetic models defined a maximum specific growth rate of 2.7/hr, a saturation constant of 2,583 mg COD/liter, a yield of 0.31 mg volatile suspended solids/mg COD utilized, and a decay constant of 0.065/hr. The methane phase yielded maximum specific growth rates of 0.43 and 0.86/day and saturation constants of 369 mg acetic acid and 164 mg butyric acid/liter for acetic and butyric acid-utilizers, respectively. (Lisk-FIRL)
W78-11859

CONTROL AMMONIA NITROGEN WITH SINGLE-STAGE NITRIFICATION - BIOLOGICAL CONVERSION OF AMMONIA CAN BE MADE USING THE ACTIVATED SLUDGE PROCESS,
Metropolitan Sanitary District of Greater Chicago, IL.
W. L. Munch.
Water and Wastes Engineering, Vol 15, No 2, p 16-20, August, 1978. 3 fig, 1 tab, 2 ref.

Descriptors: *Activated sludge, *Nitrification, *Ammonia, *Nitrogen fixing bacteria, *Sewage sludge, Mathematical models, Analytical techniques, Operations research, Optimization, Dissolved oxygen, Growth rates, Waste water treatment, Municipal wastes.

Control parameters were identified and mathematical models were developed for maintaining nitrificaton activity in activated sludge treatment reactors. Single-stage nitrification was dependent upon the solids retention time (SRT). The SRT, in turn, controlled the net microbial growth rate in the reactor, especially that of Nitrosomonas and Nitrobacter. The growth of nitrifying bacteria was also affected by temperature, ammonia-nitrogen, dissolved oxygen, pH, toxic metals, and organic compounds. The SRT, which must be increased for the growth of nitrifying bacteria, could be controlled by calculating the mixed liquor suspended solids concentration, the total aeration tank volume, and the sludge wasting rate. At a specific SRT, the aeration tank solids content was calculated from the mixed liquor suspended solids and the aeration tank volume; the sludge wasting rate was the quotient of the total solids level in the aeration tank and the solids retention time. the required waste sludge flow rate was obtained from the sludge wasting rate the the waste sludge solids concentration. Utilizing these mathematical models, the 1,440 mgd West-Southwest sewage treatment works in Stickney, Illinois, conveted its four aeration facilities to simultaneous nitrification. A graph, developed from the model studies, depicted the optimum parameters for nitrification in each facility. Implementation of nitrification processes in the four units reduced effluent ammonia-nitrogen concentrations at the outfall to 0.7-4.6 mg/liter over a year-long period. (Lisk-FIRL)
W78-11860

PROBLEMS ON SUBSTRATE CONCENTRATION IN DESIGNING NITRIFICATION-DENITRIFICATION METHOD WATER TREATMENT PLANTS (SHOKA DATCHISO HO MIZUSHORI PURANTO NO SEKKEI NI OKERU KISHITSU NODO NO MONDAI),
S. Fukunaga.
Ishikawa Harima Giho, Vol. 18, No. 3, p 243-246, 1978. 5 fig, 2 tab, 16 ref.

Descriptors: *Nitrification, *Denitrification, *Alcohols, *Laboratory tests, *Analytical techniques, Model studies, Nitrogen, Design criteria, Carbon, Waste water treatment, Municipal wastes.

Laboratory experiments verified hypotheses obtained from a literature review that denitrification rates in waste water treatment systems were controlled by the concentration of methanol in the influent. In nitrification-denitrification process, methanol was assumed to be a source of organic carbon which influenced the rate of denitrification. Tests conducted in a laboratory reactor revealed that the change of the denitrification rate along the process line was directly related to the concentration gradient of methanol in the apparatus. Denitrification was also directly dependent upon the temperature maintained within the apparatus. Permissible concentrations of nitrogen in the influent and methanol in the effluent were cited as important considerations in designing denitrification systems. (Lisk-FIRL)
W78-11861

HYGIENIZATION OF SEWAGE SLUDGE WITH ELECTRON BEAMS.
Sulzer Technical Review, Vol 50, No 4, p 179, 1977. 1 fig.

Descriptors: *Electronic equipment, *Disinfection, *Sewage sludge, *Deflection, *Penetration, Conveyance structures, Sludge treatment, Irradiation, Equipment, Waste water treatment, Municipal wastes.

The Sulzer electron beam-hygienization plant for disinfection of sewage sludge employs an electron accelerator and scanner system, in addition to a sludge supply, dosing, and regulating system. Electron beams, emitted from an electron source with a heated cathode, are fine and tightly packed with low energy. The electrons gain maximum energy as they pass through an accelerator in a vacuum. A scanner system containing a thin titanium foil strip is used to deflect the electron beam by an alternating magnetic field to adapt the beam to the width of the sludge. A sludge dosing system continuously distributes a preset amount of sludge onto a conveyor roller at a thickness suitable for electron beam penetration. The electrons are braked as they come into contact with the 2,000 mm width of the sludge on the conveyor roller. Throughput speed is determined by the beam current; throughput quantity is controlled by the sludge thickness and width, and the roller rotation speed. (Lisk-FIRL)
W78-11883

TOWARD THE EFFLUENT-FREE BLEACHED KRAFT PULP MILL (VERS L'USINE DE PATE KRAFT BLANCHIE SANS EFFLUENT),
Centre Technique du Papier, Grenoble (France).
For primary bibliographic entry see Field 3E.
W78-11899

CLOSED WATER CYCLE SYSTEMS AT PULP AND PAPER MILLS (SISTEMY ZAMKNUTOGO VODOPOL'ZOVANIYA NA PREDPRIATIYAKH OTRASLI),
For primary bibliographic entry see Field 3E.
W78-11901

COLOR REMOVAL FROM KRAFT MILL CAUSTIC EXTRACTION EFFLUENT USING ALUMINUM AND IRON,
Saskatchewan Univ. Saskatoon.
M. S. Nasr, and D. G. MacDonald.
The Canadian Journal of Chemical Engineering, Vol 56, No 1, p 87-93, February, 1978. 11 fig, 25 ref, 2 tab.

Descriptors: *Bleaching wastes, *Waste water treatment, *Decoloring, Color, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Pulp wastes, Aluminum compounds, Iron compounds, Hydrogen ion concentration, Lignins, Salts, Chemical precipitation, Kraft mills.

The highly colored compounds found in the caustic extraction effluents of kraft bleach plants can be removed by chemical reaction with trivalent metal ions, Me(III), notably Al and Fe. At pH of 2.8 or less, these ions react stoichiometrically with carboxylic acid groups (A) on the lignin compounds to form moderately soluble MeA(3) salts. Above pH 2.8, the OH ions compete with the A groups for the Me(III) ions to forms highly insoluble metal salts. Maximum color removal (i.e maximum insolubility) occurs at pH 5 for Al and pH 3.3 for Fe. Color removals of 99.6% and 98.8% can be achieved with Al and Fe, respectively, for an effluent containing 12,000 APHA color units treated with 7 moles of Al or Fe ions per cu m of effluent. (Witt-IPC)
W78-11902

USE OF WASTE LIQUOR FROM BISULFITE PULPING TO PRODUCE MIXED CULTURE SINGLE-CELL PROTEIN,
Quebec Univ., Trois-Rivieres.
S. N. Lo, J. R. Moreau, and G. St.-Laurent.
The Canadian Journal of Chemical Engineering, Vol 56, No 1, p 94-98, February, 1978. 1 fig, 23 ref, 8 tab.

Descriptors: *Sulfite liquors, *Waste water treatment, *Activated sludge, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Pulp wastes, Waste treatment, Pulp and paper industry, Proteins, Biological treatment, Cultures, Canada, Foreign countries, Water pollution control, Carbohydrates, Vitamins, Return(Monetary), Spent sulfite liquor, Sulfite pulp mills, Economics, Byproducts.

The activated sludge process might be used in the near future to treat spent sulfite liquor from small bisulfite pulp mills (less than 300 tons/day) in Canada as a means of controlling water pollution. It was found that bio-sludge solids from such a process contained approximately 38% protein, 47% carbohydrates, some vitamins, and essential minerals. This biosubstance, a mixed culture in nature, can be considered as a good source of single-cell protein. A laboratory procedure for producing this biomass in a sterile and dried form is described. The conversion of carbohydrates in spent sulfite liquor to biomass was carried out in a 400-liter aerated continuous-flow reactor. Under the operating conditions studied, the sludge yield coefficient was 0.53 g of biomass/g of carbohydrates removed. Cash returns from the sale of biomass by two bisulfite mills (a high-yield mill producing 250 tons/day and a low-yield mill producing 300 tons/day of pulp) would probably offset the cost of operating their biological effluent treatment plants. (Witt-IPC)
W78-11903

IMPROVED HEAT ECONOMY WITH LOCKMAN PRE-EVAPORATION AT THE HUSUM SULFATE MILL USING DIGESTER FLASH STEAM,
MoDo-Chemetics A. B., Ornskoldsvik (Sweden).
For primary bibliographic entry see Field 3E.
W78-11904

IN-PLANT RECYCLE AND REUSE IN AN INTEGRATED FINE PAPER MILL,
Boise Cascade Corp., Rumford, ME.
For primary bibliographic entry see Field 3E.
W78-11906

DEGRADABILITY OF TOXICANTS IN CHLORINATION STAGE EFFLUENTS,
British Columbia Research Council, Vancouver.
J. M. Leach, J. C. Mueller, and C. C. Walden.
Canadian Pulp and Paper Association Technical Section, 64th Annual Meeting (Montreal), Preprints, p B123-B129, January 31-February 3, 1978. 11 ref, 6 tab.

Descriptors: *Bleaching wastes, *Waste water treatment, *Toxicity, Degradation(Decomposition), Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Hydrogen ion concentration, Pulp wastes, Foreign countries, Canada, Aeration, Chlorides, Ions, Biological treatment, Effluents, Biodegradation.

The effect of pH, in the absence of microorganisms, on the detoxification by aeration of kraft and sulfite pulp bleaching (chlorination-stage) effluents was studied. Biodegradability was also measured separately at pH 7 laboratory fermentation units. Kraft pulp chlorination effluents were detoxified by aeration for 6 days under sterile conditions at pH 7 or 9. However, an effluent sample from high-temperature chlorination was not detoxified at these pH values. Detoxification was accompanied by release of chloride ion. Only limited degradation of the toxic material occurred at pH 3. Toxicants in sulfite pulp chlornation effluents were less degradable than those in kraft mill effluents. Biological treatment improved the rate of toxicity removal compared with aeration under sterile conditions. (Swichtenberg-IPC)
W78-11907

DETOXIFICATION OF LINERBOARD EFFLUENTS USING PHYSICAL-CHEMICAL TECHNIQUES,
Pulp and Paper Research Inst. of Canada, Pinte Claire.
J. Dorica, and A. Wong.
Canadian Pulp and Paper Association Technical Section, 64th Annual Meeting (Montreal), Preprints, p B179-B184, January 31-February 3, 1978. 7 fig, 23 ref, 2 tab.

Descriptors: *Pulp wastes, *Toxicity, *Waste water treatment, Aeration, Activated carbon, Coagulation, Wastes, Industrial wastes, Pulp and paper industry, Water pollution treatment, Water pollution sources, Waste treatment, Oxone, Suspended solids, Hydrogen ion concentration, Biochemical oxygen demand, Lime, Chemical precipitation, Nutralization, Filtration, Foreign countries, Canada, Aluminum sulfate, Decoloring, Kraft mills, Linerboard, Board mills, Color, Effluents.

Kraft linerboard effluent samples were detoxified at the Pulp and Paper Research Institute of Canada by physiochemical treatment techniques using (1) aeration in the presence of powdered activated carbon followed by coagulation with alum and (2) ozone treatment of effluents containing little or no suspended solids at neutral pH. The former technique also resulted in simultaneous decolorization and a 25% reduction in BOD. In the case of ozone treatment, no color removal and a slight increase in BOD occurred. Single-stage effluent treatment using lime, alum, or ozonization of the raw unfiltered effluent was found to be unsatifactory for consistent detoxification of highly toxic effluents. Lime precipitation increased the effluent toxicity slightly. Effluent neutralization to pH 7 followed by filtration significantly decreased toxicity. (Swichtenberg-IPC)
W78-11908

EFFLUENTS FROM PAPER MILLS,
For primary bibliographic entry see Field 3E.
W78-11909

RECENT ADVANCED TREATMENT PROCESSES FOR WASTEWATER AND SLUDGE IN THE PAPER AND PULP INDUSTRY,
Hitachi Plant Engineering and construction Co. Ltd. (Japan).
K. Izawa, Y. Suga, T. Yamaguchi, and K. Kishigami.
Hitachi Review, Vol 25, No 5, p 183-188, 1976. 6 fig, 4 tab.

Descriptors: *Pulp wastes, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Lime, Bleaching wastes, Electrolysis, Burning, Activated carbon, Sludge disposal, Incineration, Black liquor, Kraft mills, Waste paper.

The recent strengthening of waste water discharge regulations has rendered inadequate the flocculation/sedimentation or flotation method which has been conventionally applied to pulp and paper effluent treatment. Descriptions are given of the following methods for treating pulp and paper industry effluent: Hi-Lime (high lime dosage) treatment of kraft bleach plant effluent, electrolysis of waste-paper mill effluent, black liquor incineration, and activated carbon treatment. Sludge incineration is also described. (Witt-IPC)

W78-11910

WASTE-WATER CENTRIFUGAL DECANTERS FOR SEWAGE TREATMENT PLANTS.
For primary bibliographic entry see Field 8C.
W78-11911

CHARACTERIZATION OF DISPERSED RESIDUAL SOLIDS IN BIOLOGICALLY TREATED PULP AND PAPER MILL EFFLUENTS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
J. J. McKeown, and H. S. Costa.
NCASI Stream Improvement Technical Bulletin, No 303, 24 p, February, 1978. 4 fig, 10 illus, 5 ref, 4 tab.

Descriptors: *Pulp wastes, *Suspended solids, *Particle size, *Biological treatment, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Oxidation lagoons, Aerated lagoons, Microscopy, Electron microscopy, Zeta potential, Foods, Aquatic insects, Organic matter, Colloids.

The particle size and size distribution of suspended solids in biologically treated effluents from three full-scale aerated stabilization basins and a pilot-plant basin were determined using scanning electron and optical microscopy. The solids were also characterized by zeta-potential measurements and by determination of their deoxyribonucleic acid content. The study showed that the residual solids were principally organic in nature and generated during treatment. Particle sizes were 1-8 micrometers, a suitable range for aquatic insect food and a limiting range for effective removal by sedimentation and filtration. The stability of these dispersed solids is attributed to steric hindrance and/or adsorption of hydrated hydrophilic colloids rather than to charge repulsion. (Swichtenberg-IPC)
W78-11913

ENERGY SAVINGS: EXAMPLE OF THE TARASCON MILL (OF LA CELLULOSE DU RHONE) (ECONOMICS D'ENERGIE: POUR L'EXEMPLE TARASCON),
M. Garaud.
La Papeterie, Vol 99, No 11, p 525-526, 529, 531, November, 1977. 2 fig, 4 illus.

Descriptors: *Evaporation, *Pulp wastes, *Waste water treatment, Evaporators, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Foreign countries, Steam, Black liquor, Kraft mills, Europe, France.

The six-effect black-liquor evaporator installed at a French kraft pulp mill is described. The evaporator units are of the long vertical tube type and are equipped with internal pre- and/or post-reheaters. Yield of the installation is 4.4 tons of steam/ton of water evaporated, giving a savings of about 1 ton of steam/ton of pulp produced at the mill. (Speckhard-IPC)
W78-11915

OPERATING EXPERIENCE WITH VOITH CLAIFIERS IN A BOARD MILL (BETRIEBSERFAHRUNG MIT DEM VOITH-RUNDKLAERBECKEN IN EINER KARTONFABRIK),
Deutsche Zuendholzfabriken G.m.b.H., Baiersbronn (West Germany).
W. Gey.
Der Papiermacher, Vol 28, No 2, p 25-29, February 18, 1978. 6 fig.

Descriptors: *Pulp wastes, *Waste water treatment, *Clarifiers, *Operation and maintenance, Board mill, Foreign countries, Europe, Water pollution treatment, Water pollution sources, Wastes, Industrial wastes, Pulp and paper industry, Waste treatment, Germany, White water(Paper machines), Fiber recovery.

A Voith Clarifier installed at a German paperboard mill is described. The clarifier is designed to handle 250-300 cu m/hr of paper-machine white water and other effluents, recovering fibers as a suspension having a consistency of at least 2%. The clarifier features a floor with a very slight incline.(Speckhard-IPC)
W78-11916

COST OF ENVIRONMENTAL CONTROL IN THE PULP AND PAPER INDUSTRY (NAKLADY NA OCHRANU ZIVOTNEHO PROSTREDIA V PRIEMYSLE CELULOZY A PAPIERA),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
V. Kubelka, and G. Milchova.
Papir a Celuloza, Vol 32, No 11, p 297-300, 304, November, 1977. 5 ref, 11 tab.

Descriptors: *Pulp and paper industry, *Pollution abatement, *Costs, Water pollution sources, Air pollution, Water pollution control, Economics, United States, Canada, North America, Biochemical oxygen demand, Suspended solids, Capital costs, Operating costs, Europe, Sweden, Czechoslovakia.

The pulp and paper industry is blamed as a major water and air polluter, but the public does not realize that during the last years the industry considerably reduced the discharge of pollutants at an enormous cost. Based on data from Western Europe (mainly Sweden), U.S.A., and Canada, it is shown that for all pulp and paper industry categories, the BOD and suspended solids discharge has been significantly reduced since 1970. Tables are given showing current capital and operating costs of water and air pollution control in Sweden. The pulp and paper industry is among the most environmentally advanced industries. Future attention has to be directed toward improved pulping and papermaking processes to achieve the pollution-free mill goal. When the above cost data are applied to the Czechoslovakian pulp and paper industry, there will be a need for over 900 million Kcs (Czechoslovakian crowns) in additional funds to reach the desired pollution control level. (Trubacek-IPC)
W78-11917

MODERN METHODS OF UTILIZATION OF KRAFT PULP MILL CONDENSATES (WSPOLCZENSNE SPOSOBY ZAGOSPODAROWANIA KONDENSATOW Z CELULOZOWNI SIARCZANOWYCH),
Instytut Celulozowo-Papierniczy, Lodz (Poland).
For primary bibliographic entry see Field 3E.
W78-11918

A TEST AND A TECHNIQUE FOR PREDICTING FIVE DAY BOD VALUES OF KRAFT MILL WASTE,
Federal paper Board Co., Riegelwood, NC.
For primary bibliographic entry see Field 5A.
W78-11920

STUDY OF FILTER PRESS DEWATERING OF SLUDGE FROM THE EFFLUENT TREATMENT PLANT AT THE SLIVNITSA FIBERBOARD MILL (IZSLEDVANIYA VYRKHU MEKHANICHNOTO OBEZVODIYAVANE NA UTAJKITE OT PRECHISTVATELNATA STANTSIYA NA ZAVODA ZA D'RVESPOVLAKNESTI PLOSKOSTI – GR. SLIVNITSA, S FILT'R-PRESA),
For primary bibliographic entry see Field 5E.
W78-11921

REAGENT-FREE METHOD OF EFFLUENT NEUTRALIZATION (BEZREAGENTNYI METOD NEITRALIZATSII STOKOV),
Selenginskii Tsellyulozno-Kartonnyi Kombinat (USSR).
V. I. Meshkov.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No. 26, p 5, October, 1977.

Descriptors: *Waste water treatment, *Pulp wastes, *Neutralization, *Aeration, Waste treatment, Hydrogen ion concentration, Carbon dioxide, Water pollution treatment, Wastes, Effluents, Acidic water, Liquid wastes.

Aeration is used toneutralize acidic pulp mill effluents after chemical treatment. Aeration lowers the carbon dioxide content, thereby increasing pH from 5.9-6.0 to 6.5-70. In winter, aeration should be intensified to 0.4 cu m of air per cu m of water, because of increased carbon dioxide content in the water. (DuVall-IPC).
W78-11925

ECONOMICAL EXPEDIENCY OF FLOTATION SAVEALL MODERNIZATION (EKONOMICHESKAYA TSELESOOBRAZNOST' MODERNIZATSII FLOTATSIONNYKH LOVUSHEK),
Vsesoyuznyi-Nauchnyi Planovii Otdel Bumazhnoi Promyshlennost, Moscow (USSR).
V. A. Kopylov.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No. 29, p 3-4, October 1977. 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Flotation, Wastes, Industrial wastes, Water pollution treatment, Waste treatment, Water pollution sources, Pulp and paper industry, Water purification, Effluents, Savealls, Printing papers, Sized papers, Rosin, Aluminum oxide, Polyacrylamide, White water(Paper machines).

A study of 30 flotation savealls showed that fully modernized Sveen-Pederson flotation savealls may be effectively used for white water solids recovery in the manufacture of rosin-sized papers with ash contents below 10%. Effluent from production of printing papers with ash contents up to 20% can be treated with a supplementary 5-7 mg/liter rosin size, 3 mg/liter of aluminum oxide, and 5 mg/liter of polyacrylamide. (DuVall-IPC).
W78-11926

UTILIZATION OF SCRUBBER WATER FROM LIME RECOVERY FURNACES (UTILIZATSIYA SKRUBBERNYKH VOD IZVESTEREGENERATSIONNYKH PECHEI),
Bratskii Lesopromyshlennyi Kompleks (USSR).
For primary bibliographic entry see Field 3E.
W78-11928

OPERATION OF SIMPLEX MECHANICAL TURBINE AERATORS IN AN EFFLUENT TREATMENT INSTALLATION (RABOTA MEKHANICHESKIKH TURBOAERATOROV 'SIMPLEKS' NA OCHISTNYKH SOORUZHENIYAKH),
Svetogorskii Tsellyulozno-Bumazhnyi Kombinat (USSR).
N. P. Panchekhin, and E. A. Zhukova.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No. 32, p 9, November, 1977.

Descriptors: *Pulp wastes, *Waste water treatment, *Aerator, Waste, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Foreign countries, Operation and maintenance, Dissolved oxygen, Biological treatment, Pulp and paper industry, Aeration, Soviet Union(USSR).

Each of the 5 aeration tanks in the biological effluent-purifying station at the Svetogorsk Pulp and Paper Complex (USSR) is equipped with 8 Sim-

pled turbo-aerators that have a net power of 48 kw and can provide 1.7 kg of dissolved oxygen for each kw of power. (DuVall-IPC).
W78-11929

DISPOSAL OF AEROBICALLY DIGESTED SLUDGE,
Little Blue Valley Sewer District, Independence, MO. Interim Treatment Plant.
T. Watenburger.
Public Works, Vol. 109, No. 7, p 70, July, 1978.

Descriptors: *Sludge treatment, *Dewatering, *Filtration, *Aerobic treatment, *Sludge digestion, Filters, Application methods, Gravity, Pressure, Waste water treatment, Municipal wastes.

Four Model 80 sludge concentrators, manufactured by Ecodyne Corp.'s Smith and Loveless Division, were installed at the Little Blue Valley Interim Treatment Plant in Independence, Missouri, to dewater the large quantities of sludge produced in the aerobic digester. The 20 mgd capacity interim plant treats an average of 16 mgd of waste water in two combined aeration/settlement basins, an aerobic digester, and six sand filters; the final effluent contains about 5 mg/liter BOD and 2 mg/liter suspended solids. The concentrators process 13,000-25,000 gal/day of a thickened slurry with a 49-50% organic load and 4% solids content. The sludge is treated with a cationic polymer, flash mixed, and concentrated by gravity and pressure processes to 14.5% solids content. Gravity dewatering is performed on continuous, variable speed open-mesh filter screens; three sets of compression rollers further dewater the sludge in the pressure stage. The dewatered cake is pumped to a truck for removal to land application sites. (Lisk-FIRL)
W78-11930

APPLICATION OF REVERSE OSMOSIS AND ULTRAFILTRATION TO THE PURIFICATION OF PULP AND PAPER INDUSTRY EFFLUENTS. III. SEPARATION AND CONCENTRATION OF LIGNIN COMPOUND SOLUTIONS BY ULTRAFILTRATION (ZASTOSOWANIE ODWROCONEJ OSMOZY I ULTRAFILTRACJI DO OCZYSZCZANIA SCIEKOW Z PRZEMYSLU CELULOZOWO-PAPIERNICZEGO. III. ULTRAFILTRACYJNE ROZDZIELANIE I ZATEZANIE ROZTWOROW ZWIAZKOW LIGNINOWYCH),
Instytut Inzynierii Ochrony Srodowiska Politechniki Slaskiej, Gliwice (Poland).
M. Bodzek, O. Kominek, and I. Tanistra.
Przeglad Papierniczy, Vol. 33, No. 10, p 359-363, October, 1977. 18 ref, 7 tab. English summary.

Descriptors: *Pulp wastes, *Waste water treatment, *Ultrafiltration, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Pulp and paper industry, Membrane processes, Cellulose, Lignins, Effluents, Membranes, Cellulose acetate, Lignosulfonates, Separation techniques.

Ultrafiltration experiments were conducted on solutions of alkali lignin and calcium lignosulfonates, using cellulose acetate membranes Batch-301 (unheated), UF-17, and F. Determinations were made of the filtration rate (mean) and the degree of separation of the dissolved substances. An increase of concentration (within the 50-1000 g/cu dm range) lowered the filtration rate, but increased the degree of separation. Within the 5-10 atmosphere range, an increase of pressure increased the rate of filtration, but had little effect on the degree of separation. An 80% ultrafiltrate recovery was achieved with all concentrations and membranes. Generally, the retention of alkali lignin by the membranes was better than the retention of calcium lignosulfonates. Membrane UF-17 appeared more advantageous for the lignosulfonates. Larger scale experiments with actual mill effluents are needed to confirm the suitability of ultrafiltration for purification of industrial waste waters. (See also W78-00453; W77-09733 and W78-11933) (Stapinski-IPC)
W78-11932

APPLICATION OF REVERSE OSMOSIS AND ULTRAFILTRATION TO THE PURIFICATION OF PULP AND PAPER INDUSTRY EFFLUENTS. IV. PURIFICATION AND CONCENTRATION OF PULP WASHING EFFLUENTS BY ULTRAFILTRATION (ZASTOSOWANIE ODWROCONCJ OSMOZY I ULTRAFILTRACJI DO OCZYSZCZANIA SCIEKOW Z PRZEMYSLU CELULOZOWO-PAPIERNICZEGO. IV. ULTRAFILTRACYJNE OCZYSZCZANIE I ZATEZANIE SCIEKOW Z MYCIA MAS CELULOZOWYCH),
Instytyt Inzynierii Ochrony Srodowiska Politechniki Slaskiej, Gliwice (Poland).
M. Bodzek, O. Kominek, and I. Tanistra.
Przeglad Papierniczy, Vol. 34, No. 1, p 5-9, January, 1978. 4 fig, 8 ref, 5 tab. English summary.

Descriptors: *Pulp wastes, *Waste water treatment, *Reverse osmosis, *Ultrafiltration, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Pulp and paper industry, Membrane processes, Cellulose, Color, Effluents, Membranes, Black liquor, Sulfite liquors, Spent sulfite liquor, Cellulose acetate.

Ultrafiltration was carried out in a laboratory apparatus using F1, F2, and UF-17 cellulose acetate membranes, untreated and thermally treated at 50C. All experiments were conducted at room temperature and a gage pressure of 10 atmospheres to a predetermined ultrafiltrate recovery (defined as the ratio of the ultrafiltrate to the initial volume of the effluent). The effluents used in the study, which were equivalent by their composition to pulp washing effluents, were obtained by diluting a black liquor and a spent sulfite liquor to varying degrees and adjusting the pH to 7.6. The initial concentration of the effluents affected the rate of filtration and the load of the filtrate and the concentrate; the load of the filtrate, however, increased more slowly than the load of the concentrate. At an ultrafiltrate yield of 70%, the load reduction was 75-85%, and the color reduction over 90%. The UF-17 membranes gave a higher degree of purification, but had generally lower filtration rates. Ultrafiltration can be an effective means of decoloring effluents while achieving a relatively high load reduction. (See also W78-00453; W77-09733 and W78-11932) (Stapinski-IPC)
W78-11933

WATER FILTRATION METHOD,
H. E. Orensten, and V. C. Orensten.
U.S. Patent No. 4,077,877, 9 p, 6 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 968, No 1, p 279, March 7, 1978.

Descriptors: *Patents, *Water quality control, *Filtration, Aquiculture, Aquatic life, Bacteria, Filters, Aeration, Waste water treatment.

Efficient biological and mechanical and/or chemical filtration or purification of the water in an aquatic life support system is achieved with a submerged device through which a high water flow rate is induced by a generally vertical flow of air through the hollow core of one or more filtration elements. Each filtration element accommodates a high flow rate (e.g. more than 50 gallons per hour) and can contain a viable colony of nitrifying bacteria. The preferred filtration device is comprised of a base with air inlets and air passageways to the hollow core of each filtration element. The base supports the filtration elements. (Sinha - OEIS)
W78-11940

MIXING APPARATUS FOR BIOCHEMICAL TREATMENT OF FLUIDS WITH OXYGEN,
Worthington, Pump, Inc., Mountainside, NJ. (Assignee).
B. Neumann.
U.S. Patent No. 4,079,008, 5 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 968, No 2, p 655-656, March 14, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Biologic treatment, Aerobic conditions, Aeration, Mixing, Turbulence, Jets, Equipment.

A mixing vessel is provided for the treatment of wastes with aerobic bacterial cultures having high-turbulent mixing under conditions supportive of rapid waste digestion. The mixing vessel contains a chamber with a sparger depending into the central portion and providing streams of incoming untreated waste feed that are distributed radially from the longitudinal axis of the vessel. Medially positioned in the chamber is an annular collector concentric to the sparger for withdrawing waste material under treatment into a recirculation loop. The collector is connected with a recirculation pump, a system outlet, an aeration fluid delivery means and a jet injector. The jet injector has a nozzle for propelling at high velocities a jet of fluids upwardly into the chamber along the longitudinal axis. The jet is comprised of recirculation wastes and entrained air. Rapid digestion may be achieved as aerobic bacterial culture contact with the waste under treatment in enhanced by the turbulent flow conditions and aeration fluid flow to support bacterial growth may be optimized. (Sinha - OEIS)
W78-11946

SYSTEM FOR RECYCLING WATER SOLUBLE WASTE LIQUIDS,
R. P. Malakul.
U.S. Patent No. 4,080,247, 7 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 968, No 3, p 1081-1082, March 21, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Chemical wastes, Reclamation, Evaporation, Water reuse, Ethylene glycol.

A system for reclaiming solutions of waste chemicals such as ethelene glycol is provided. The water in the ethelene glycol is distilled or evaporated off at temperatures below the boiling point of the glycol. The system includes two or more interconnected evaporating stages each having a heating coil. The last or final evaporating stage is provided with an aqueous solution sensing loop for removing portions of reclaimed solution at predetermined levels and is provided with water sensing station for removing condensed steam or returning contaminated water to the input of the system. (Sinha - OEIS)
W78-11951

SLUDGE DEWATERING WITH CENTRIFUGES.
Water Services, Vol 82, No 989, p 399, July, 1978.

Descriptors: *Centrifugation, *Dewatering, *Sludge treatment, *Sewage sludge, *Centrifugal pumps, Waste water treatment, Separation techniques, Septic tanks, Sludge disposal, Municipal wastes.

KHD Industrieanlagen AG manufactures three types of solid bowl and screen centrifuges for dewatering sewage sludges. Solid bowl centrifuges, operating on the co-current principle, dewater sludges at throughput rates up to 120 cu m/hr when the rotor and screw speeds match the feed rate. The feed point is located in front of the drum's solid rear wall; this configuration allows for a settling zone in proximity to the feed point. Septic tank size at treatment facilities an be reduced when the centrifuge precedes the tank, reducing

the quantity ofsludge to be treated; centrifuges located after the tanks further reduce sludge. Besides primary dewatering, the centrifuges dewater digested sludges for storing or recycling. The solid bowl centrifuges can operate efficiently at low feed concentrations and provide extended settling durations for minute particle removal and improved solids compaction. (Lisk-FIRL)
W78-11952

SYMBIOTIC MEMBRANE SYSTEMS,
D. Pilson.
U.S. Patent No. 4,080,288, 5 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 968, No 3, p 1092-1093, March 21, 1978.

Descriptors: *Patents, *Waste water treatment, Industrial wastes, Water pollution treatment, Separation techniques, Membrane processes, Semipermeable membranes.

An improved process of operating system and reactor for treating organic and inorganic wastes is described. The improvement of the invention consists of placing a membrane in the reactor between the gas phase and the liquid phase or biomass. The membrane is selected to control the flow of nitrogen and oxygen from the gas phase to the liquid phase or biomass and to control the flow of carbon dioxide from the biomass to the gas phase. By controlling the flow of oxygen and nitrogen through the membrane, an altered or desired atmosphere is established with an increased level of oxygen in contact with the liquid phase thereby permitting increased biological level of oxygen in contact with the liquid phase thereby permitting increased biological activity and a higher treatment efficiency (i.e, biochemical oxygen demand removal) in the reactor is obtained. (Sinha - OEIS)
W78-11953

APPARATUS FOR TREATING WASTE WATER OR SOLUTION,
Hitachi, Ltd. (Japan); and Hitachi Plant Engineering and Construction Co., Ltd. (Japan).
K. Ebara, T. Ogawa, and S. Takahashi.
U.S. Patent No. 4,080,289, 18 p, 16 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 968, No 3, p 1093, March 21, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Industrial wastes, Reverse osmosis, Membrane processes, Semipermeable membranes, Separation techniques, Suspended solids, Scaling.

This invention relates to a treatment of waste water or solution, especially industrial waste water, by membrane process, and provides a method for treating scales and suspended materials precipitated or settled on the surface of a semipermeable membrane. Waste water is separated into a permeated solution and a concentrated solution by feeding the waste water or solution to a reverse osmosis apparatus using a membrane. A chemical pretreating apparatus prevents hard scales contained in the waste water or solution from precipitation during the concentration in the reverse osmosis apparatus. An apparatus for charging sponge balls is provided to mechanically remove suspended solids and other suspended matters, that is, soft scales when deposited on the surface of the membrane. The sponge balls are reused. (Sinha - OEIS)
W78-11954

SMALL CONTRACTORS TAKE ON TOUGH PIPE PLACEMENT.
Engineering News-Record, Vol 201, No 4, p 28, July, 1978.

Descriptors: *Interceptor sewers, *Construction joints, *Concrete pipes, *Welded joints, *Fabrication, Concrete, Conduits, Construction equipment, Construction materials, Sewerage, Linings, Waste water disposal, Municipal wastes.

A 15 ft steel elbow was used to connect an 84-inch diameter interceptor sewer to a new 72-inch diameter line that directs sewage to grit and screening operation in Newark, New Jersey. The 72-inch pipe consists of prefabricated concrete sections that were embedded in concrete to line an abandoned interceptor. The 2.5-ton elbow, which connects the refurbished line with Newark's city and airport interceptors, was bolted and braced in place within 6 hrs. Work was hastened when sewage behind the blocked-off construction site threatened to overflow into city streets. The elbow had one round flanged end and one square end connecteing to a concrete sluice; the pieces were bolted in place, thrust braced, and connected to the lines with vertical supports. The new line is part of a waste water treatment project currently under construction for Newark. Vacar Construction Corp., of Williston Park, New York, was the subcontractor for the elbow installation. (Lisk-FIRL)
W78-11956

SEWAGE PLANT BENEFITS FROM ADJUSTABLE FREQUENCY DRIVES.
Control Engineering, Vol. 24, No. 12, p 22, December, 1977.

Descriptors: *Pumps, *Treatment facilities, *Georgia, Equipment, *Design data, Waste water treatment, Liquid wastes, Electric motors, Sanitary engineering.

A Georgia sewage treatment plant has installed adjustable speed raw sewage pumps. General Electric's Speed Variator Products in Erie, Pennsylvania, produces the inverter drives used in the 10-mgd system. Incoming power is converted from AC to DC with a silicon diode rectifier and then inverted to adjustable AC voltage and frequency. This is accomplished by an SCR invertor with pulsewide modulation. The invertors provide four operable modes: two automatic and two manual. The lead pump operates at speeds adjusted according to flow measurements by the automatic bubbler sensor system. the lead pump operates at a constant speed controlled by the power bus when the lead pump is inadequate for the rate of flow. The lag pump starts automatically and maintains a desirable influent level with adjustible speed. Increased flow at this point causes the lag pump, controlled by the power bus, to increase to constant speed. When flow decreases, each pump reverts in sequential order to original drive. The system shuts down sequentially when a power failure occurs and starts in a prescribed order when power returns. The system was designed by Robert and Co Associates of Atlanta, Georgia. (Lisk-FIRL)
W78-11997

OZONE GIVES WASTE WATER THE TREATMENT.
Chemical Week, Vol. 122, No. 25, p 49, June, 1978.

Descriptors: *Ozone, *Disinfection, *Pilot plants, *Activated carbon, *Treatment facilities, Costs, Sewage treatment, Water treatment, Waste water treatment, Tertiary treatment, Activated sludge.

The use of ozone for water and waste water treatment in the United States is increasing, with the largest current application being the 30 mgd waste treatment plant in Springfield, Missouri. Major suppliers of ozone-producing equipment in the United States include Emery Industries, Union Carbide, Crane, Wellsbach, PCI, Trailigaz, and Degremont. Several current projects and contracts anticipated by these suppliers are described, including waste water treatment plants in: Meander, Ohio; Olympia, Washington; Indianapolis, Indiana; Tacoma, Washington; and Cleveland, Ohio. Cleveland's Westerly plant has used ozone-generating equipment supplied by Emery for disinfection, as well as to enhance tertiary treatment with activated carbon. EPA-sponsored pilot studies in several cities are currently testing the feasibility of activated carbon-ozone treatment for potable water. Additional EPA studies have examined dosage requirements for high level disinfection and compared costs for ozonation and chlorination. (Schulz-FIRL)
W78-11999

TOWN ABANDONS TERTIARY SEWAGE PLANT.
Engineering News-Record, Vol 201, No 1, p 11, July, 1978.

Descriptors: *Tertiary treatment, *Spray irrigation, *Application methods, *Filtration, *Clogging, Return flow, Sands, Filters, Polymers, Chemical precipitation, Failures, Waste water treatment, Municipal wastes.

Moosehead, Maine, Sanitary District's three-year-old tertiary treatment plant in Greenville will be replaced by a secondary effluent land application treatment system. The 250,000 gpd tertiary plant cost $4.3 million to construct; annual estimated operation and maintenance costs of $28,000 increased to $125,000 due to overtime paid to employees attempting to fix the sand filters. The upper 6 inches of the third stage 5 ft-long sand filters had clogged repeatedly with secondary effluent. Polymers could not alleviate the clogging problem and effluent was bypassed. Chemical treatment was applied directly to the final clarifiers. The proposed $2.5 million land application system will spray 80 acres of private woodlands with secondary effluent. (Lisk-FIRL)
W78-12005

SUBMERSIBLE SEWAGE PUMPS.
For primary bibliographic entry see Field 8C.
W78-12036

SOURCES AND CHARACTERISTICS OF SOLUBLE ORGANIC NITROGEN IN ACTIVATED-SLUDGE EFFLUENTS,
Stanford Univ., CA.
For primary bibliographic entry see Field 5A.
W78-12039

STOCHASTIC PROGRAMMING MODEL FOR WATER QUALITY MANAGEMENT IN A RIVER,
Asian Inst. of Tech., Bangkok (Thailand).
B. N. Lohani, and N. C. Thanh.
Journal Water Pollution Control Federation, Vol 50, No 9, p 2175-2182, September 1978. 7 fig, 1 tab, 5 ref, 1 append.

Descriptors: *Water quality control, *Regional management, *Rivers, *Stochastic processes, *Chance-contrained programming, *Cost minimization, Optimization, Dissolved oxygen, Biochemical oxygen demand, Reliability, Probability, Operating costs, Mathematical models, Streamflow, Standards, Pollution abatement, Hsintien River(Taiwan), Equations, Systems analysis.

Considered is the determination of degree of waste reduction in a regional water quality management system. Presented is a stochastic programming model which minimizes the total operating cost of biochemical oxygen demand removal by ascertaining the degree of removal required at each treatment facility, without violating the desired oxygen standards in the stream. A zero-order decision rule chance-constrained programming model yields a deterministic equivalent that is a straightforward programming problem easily solvable by the available algorithm. The model includes a reliability parameter that provides an economic tradeoff between a desired water quality and the degree of satisfaction for a given annual budget. The model can be used to find the monthly optimal solutions

so that the full assimilative stream capacity may be used. The active treatment plants should be identified and operated with a higher skill and strict control. (Bell-Cornell)
W78-12041

OPTIMAL DESIGN OF REGIONAL WASTEWATER SYSTEMS: A FIXED-CHARGE NETWORK FLOW MODEL,
Georgia Inst. of Tech., Atlanta.
J. J. Jarvis, R. L. Rardin, V. E. Unger, R. W. Moore, and C. C. Schimpeler.
Operations Research, Vol 26, No 4, p 538-550, August 1978. 8 fig, 5 ref.

Descriptors: *Waste water treatment, *Design, *Optimization, *Networks, *Fixed-charge model, Water quality control, Pumping, Constraints, Mathematical models, Operations research, Equations, Cost minimization, Gravity flow, Regional systems.

Planning regional wastewater treatment systems requires that such factors as water quality, environmental impact, regional development, aesthetics, and cost be considered in the design process. Though costs are not the sole determinant of final design, the minimum cost design is a valuable input into the overall design process. A number of mathematical models for designing such systems has not led to computational success in obtaining optimal solutions to large-scale problems. This paper demonstrates how the problem of selecting a least-cost wastewater treatment system design can be modeled using network flow concepts and how special properties of the resulting network can be employed to make the problem tractable to current state-of-the-art fixed-charge network solution procedures. Described are the model, deveopment of input data, the network flow analysis method, simplifications, and results. The model includes alternative trunk-line connections, methods of treatment, and variation in system boundaries. Implementation of the procedure in Jefferson County, Kentucky is discussed. (Bell -Cornell)
W78-12043

STORAGE-TREATMENT MIXES FOR STORMWATER CONTROL,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
J. P. Heaney, S. J. Nix, and M. P. Murphy.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 104, No EE4, p 581-592, August 1978. 3 fig, 3 tab, 13 ref.

Descriptors: *Water pollution control, *Methodology, *Optimization, *Storm water, Estimating, Urban runoff, Combined sewers, Reservoir storage, Treatment, Simulation analysis, Constraints, Equations, Mathematical models, Systems analysis, United States, Ontario, Lagrange multipliers, Cost minimization, Prediction.

A methodology to estimate the cost of controlling pollution from urban storm-related discharges is presented. This procedure has been used to assess pollution from combined sewer overflows and stormwater runoff for each of the 248 urbanized areas in the United States and for a similar assessment in Ontario. Generalized predictive equations are developed for a set of assumed costs, based on relatively intensive studies of five cities: Atlanta, Denver, Minneapolis, San Francisco, and Washington. The first section describes the available storage-treatment options--their costs and effectiveness. Then, the production functions relating pollution control to storage and treatment are described. The solution to the problem of deriving the least cost mix of storage and treatment for any level of control is presented. The wet-weather optimization problem, assuming linear costs, is solved using Lagrange multipliers. Finally, a sample application of the methodology is made to a hypothetical United States city of 1,000,000. (Bell-Cornell)
W78-12046

OPTIMIZATION OF WASTE REMOVAL FOR WIDE SHALLOW RIVERS,
Drexel Univ., Philadelphia, PA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-12047

COMPARISON OF TANGIBLES AND INTANGIBLES,
Caldwell Connell Engineers, Melbourne (Australia).
For primary bibliographic entry see Field 5G.
W78-12048

PLANNING TIME-PHASED REGIONAL TREATMENT SYSTEMS,
Environmental Protection Agency, Cincinnati, OH.
L. A. Rossman.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 104, No EE4, p 685-700, August 1978. 1 fig, 5 tab, 22 ref.

Descriptors: *Waste water treatment, *Economic efficiency, *Optimization, *Massachusetts, *Regional development, *Cost control, *Cost minimization, *Expansion, Decision making, Water quality, Dynamic programming, Economic impact, Equations, Mathematical models, Systems analysis.

An economic optimization model for selecting least-cost regional wastewater treatment facility locations, interceptor routes, and capacity expansion schedules is developed. The model explicitly considers the interaction between facility location and capacity expansion decisions on total system cost. Cost functions for treatment facilities and interceptors and growth patterns for future wastewater flows may be of any form. The model is solved with a three-phase heuristic procedure utilizing dynamic programming. In comparison with a mixed integer programming model of a large-scale problem, the procedure demonstrates significant advantages in computational time, accuracy, and user requirements. The model is applied to facilities planning in a 208 study area of Massachusetts to demonstrate how the economic impacts of alternative management objectives and demographic projections can be assessed. (Bell-Cornell)
W78-12049

MODELING SEWER FLOWS USING TIME SERIES ANALYSIS,
Texas Univ. at Austin. Dept. of Mechanical Engineering.
J. W. Barnes, and F. A. Rowe.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 104, No EE4, p 639-646, August 1978. 5 fig, 14 ref.

Descriptors: *Time series analysis, Flow, *Sewers, Probability, Computer models, Simulation analysis, Sewage, Statistical methods, Design, Long-term planning, Waste water treatment, Equations, Systems analysis, Box-Jenkins method.

Recently increased national attention directed at the combined sewer overflow problem has caused computer modeling to become an increasingly important tool in the long-term planning and design of wastewater treatment plants. Statistically valid hypothetical flows are an important adjunct to the use of such modeling tools. A method for generating realistic hypothetical sewage flows based on actual flow data is presented. The generation of such flows entails the description of probabilistic models for the actual flow series. The models described herein have been constructed using the Box-Jenkins Time Series Method. Models for time spans containing periods of heavy flow are developed for two locations, Springfield, Ohio and Anderson, Indiana. The same model form adequately describes the data for both locations. Finally, a technique for generating hypothetical flow series that have the same statistical properties as the original series is given. (Bell-Cornell)
W78-12051

COST EFFICIENCIES OF LARGE-SCALE INTEGRATED DAIRY PRODUCTION AND WASTE MANAGEMENT SYSTEMS,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W78-12055

AEROBIC TREATMENT IN RELATION TO LAND APPLICATION OF SLURRY,
West of Scotland Agricultural Coll., Auchincruive, (Scotland).
S. Baines.
In: Utilization of Manure by Land Spreading. Commission of the European Communities, EUR 5672e, 1977, p. 413-432. 5 fig, 3 tab, 11 ref.

Descriptors: *Aerobic treatment, Design, Odor, Water pollution, Biodegradation, Temperature, *Waste treatment, *Farm wastes, Sludge residence time, Dissolved oxygen concentration, Pathogenic bacteria.

Data from laboratory experiments provide useful criteria for the design and operation of aerobic treatment plants to be used in systems where air and water pollution present problems. In the presence of an adequate supply of dissolved oxygen, a mixed population of microorganisms will become established and convert the chemical components of slurry from one form into another, and into microbial cells. Ultimately, aerobic metabolism will result in the production of carbon dioxide, water, inorganic salts, heat energy, and microbial cells. The variety and activity of microorganisms that become established and hence, the degree of biodegradation, depend on a variety of physical and chemical parameters including mean residence time of microorganisms or sludge residence time (SRT), dissolved oxygen concentration, and temperature. These factors are also important in the capital and operating costs of treatment systems. Because variation in operational parameters will affect the end products, the process can be manipulated to meet one or more of the desired objectives of treatment. Primary solids/liquid separation by physical and mechanical techniques must also be considered in conjunction with biological treatment to gain an appreciation of the economic and handling aspects. (Merryman-East Central)
W78-12059

A DYNAMIC MODEL OF NITRIFICATION-DENTRIFICATION IN THE ACTIVATED SLUDGE SYSTEM WITH POWDERED ACTIVATED CARBON. (VOLUMES I AND II),
Minnesota Univ., St. Paul.
J. S. Lee.
PhD Thesis, 1977. 415 p.

Descriptors: *Nitrification, *Denitrification, *Activated sludge, *Activated carbon, *Dynamic programming, Sampling, Pilot plants, Kinetics, Nitrates, Computer programs, Model studies, Waste water treatment, Municipal wastes.

A dynamic model of suspended growth biological nitrification-denitrification was developed with data from two activated sludge pilot plants, one of which contained powdered activated carbon in the

mixed liquor. The two reactors were operated with dynamic loading and were sampled every 2 hrs over 24-56 hr sampling periods. Effluent nitrate from both the nitrification and denitrification processes varied according to the cyclic flow and loading rates of the reactors; hydraulic and solids retention times directly controlled the degree of nitrification-denitrification. As dynamic loading increased, the concentration of non-biodegradable dissolved organic carbon increased in the nitrification effluent. The dynamic model, developed with a Newton-Shooting iteration computer program, predicted a higher substrate removal for powdered activated carbon. Activated sludge treatment with powdered activated carbon at 5C required a higher microbial population to effect the same degree of nitrification-denitrification obtained at 20C. Powdered activated carbon influenced denitrification kinetics; heterotrophic growth affected nitrification kinetics. The maximum growth rate coefficient was the most sensitive process parameter. (Lisk-FIRL)
W78-12066

PRESENT SITUATION AND PROBLEMS ON ENVIRONMENTAL PROTECTION AND CONSOLIDATION IN JAPAN,
Tokyo Univ. of Agriculture and Technology (Japan). Chemistry Lab.
For primary bibliographic entry see Field 5G.
W78-12073

A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND -- PART 2,
For primary bibliographic entry see Field 5G.
W78-12079

GROUNDWATER LEVELS AS AFFECTED BY SWINE WASTE LAGOONS IN HIGH WATER TABLE SOILS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
O. T. Bucklew, Jr.
M.S. Thesis, July, 1976, 102 p. 11 fig, 2 tab, 17 ref.

Descriptors: *Virginia, Ammonia, Chlorides, Heavy metals, Leaching, *Farm wastes, Waste water treatment, *Anaerobic lagoons, Groundwater pollution, *Swine wastes.

The pollution hazard from anaerobic lagoons was examined. The study involved 2 lagoons in Southeast Virginia that had heavy concentrations of ammonia, chlorides, and heavy metals, which could cause contamination of water supplies. One lagoon was located at the Virginia Polytechnic Institute and State University Tidewater Research and Continuing Education Center at Holland Station, Virginia, and the other was located on a private farm near the Holland Station. Two series of wells were installed at each lagoon and groundwater levels were recorded. The water table was then plotted to determine the presence or absence of a groundwater mound around the lagoon, which would indicate seepage from the lagoon. A statistical analysis was used to evaluate the significance of temporal and spatial variations of the water table. Study findings indicated that: (1) Based on the data collected, there were no significant water table changes that could be attributed directly to seepage from the lagoons. (2) Many variables affected the profile of the water table in the vicinity of the lagoon which made an evaluation of the water table levels more difficult. (3) There was an indication of independent groundwater movement around the lagoons. (Merryman-East Central)
W78-12084

CHARACTERIZATION AND TREATMENT OF WASTE DISCHARGED FROM HIGH DENSITY CATFISH CULTURES,
Tennessee Valley Authority, Chattanooga. Div. of Environmental Planning.
R. J. Ruane, T-Y. J. Chu, and V. E. Vandergriff.
In: Proceedings of the 30th Industrial Waste Conference, Purdue University, May 6, 7 & 8, 1975, p 1043-1065. (1975). 18 fig, 6 tab, 16 ref.

Descriptors: *Fish farming wastes, Water pollution, Sedimentation, Organic compounds, Ammonia, Nitrogen, Phosphorus, Suspended solids, Effluents, Catfish, Fecal coliforms, Settleable solids.

Organic compounds, solids, ammonia nitrogen, and phosphorus are the main pollutants from high-density channel catfish raceways. The organic compounds and total phosphate are related to concentrations of solids. Concentrations of ammonia nitrogen and phosphate are related to concentrations of solids. Concentrations of ammonia nitrogen and dissolved oxygen can be used as measures of metabolic activity. It might be more desirable to feed the catfish at least twice rather than once daily. The results of 1974 studies indicate that only concentrations of settleable solids and fecal coliform bacteria exceed the proposed EPA guidelines for effluent limitations and therefore, will require some means for removal. However, if the feeding rate had been greater, the proposed EPA limits on ammonia nitrogen and suspended solids might also have been exceeded. The waste characteristics of raceway discharges varied considerably with activity (i.e. metabolic, feeding, and flushing). However, with respect to daily mass loads of pollutants, the metabolic and feeding periods contribute essentially all the wasteload. Monitoring of raceway effluents should consist of 24-hour composited samples to 'average' the effects of the various activity periods. Also, such samples should be collected during 'normal' days for the variables that affect wastewater characteristics (i.e. dissolved oxygen concentration, feeding rate, flow rate, and type of feed used (sinking vs. floating)). Variables affecting waste characteristics include dissolved oxygen concentration, temperature, size of fish, feeding rate, stocking density, water flow, type of food, and activity period. Simple sedimentation of raceway effluents for a detention time of 15 minutes can remove more than 76 percent of the settleable solids. The effluent from such a facility contains less settleable solids than the effluent limitations proposed by EPA. Suspended solids, organic compounds, and total phosphate are removed in the settling basin to a lesser extent. Removal of these pollutants is greater during the flushing period because a larger percentage is associated with the suspended solids. Further study is needed to determine: (1) the source of the fecal coliform bacteria in raceway culture; (2) the effects of temperature, feeding rate, stocking density, and other variables on generation of fecal coliform bacteria; and (3) methods to reduce generation of the fecal coliform bacteria or to economically disinfect the raceway discharge. (East Central Univ)
W78-12086

POULTRY WASTE MANAGEMENT ALTERNATIVES: A DESIGN AND APPLICATION MANUAL,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-12093

PROCESS FOR CONDITIONING SEWAGE SLUDGE.
Australian Patent 492,957. Issued May 25, 1978. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol 48, No 18, p 1672, May, 1978.

Descriptors: *Sewage sludge, *Sludge treatment, *Sludge digestion, *Patents, *Heat treatment, Sludge disposal, Disinfection, Domestic wastes, Farm wastes, Waste water treatment, Municipal wastes.

A process has been patented for sterilizing sludge at high temperatures to condition it for land disposal. The sludge is initially heated within a temperature range of 65-150C for a period between 30 sec and 60 min. When the sludge is treated in the higher temperature ranges, the shorter time periods are used. After the sewage sludge has been thermally sterilized, it is biologically treated by digestion at a temperature of 32-60C. This conditioning process, which prepares the sludge for land disposal, is suitable for domestic as well as farm wastes. (Lisk-FIRL)
W78-12098

5E. Ultimate Disposal Of Wastes

DRIED CATTLE PAUNCH MANURE AS A FEED SUPPLEMENT FOR CHANNEL CATFISH,
Robert S. Kerr Environmental Research Lab., Ada, OK.
S. C. Yin, R. C. Summerfelt, and A. K. Andrews.
In: Proceedings, Oklahoma Industrial Wastes and Advanced Water Conference, V. 23, p. 75-82, 1972. 1 fig., 1 tab., 9 ref.

Descriptors: Bacteria, Drying, *Farm wastes, *Feeds, Refeeding, *Dried paunch manure, Catfish, Storing.

This report describes some of the preliminary work done with paunch manure prior to launching a full-scale experiment to test the feasibility of using dried paunch as a feed supplement in channel catfish culture. Data concerning actual time requirements for successful drying were inclusive, but the paunch was air dried successfully and it was found that the dehydrated product could be stored for months without spoilage. While dried paunch incorporated into fish feed conceivably could become a serious water pollutant, if the amount of feed given each day is based on a certain percentage (usually 2-3 percent) of the body weight of the fish such pollution is not likely. The feed should be consumed by the fish within a short period of time. However, in a suspended cage culture situation, the pellets may eventually drift out of the confines of the cage where the fish cannot reach them. If that should happen, the dried paunch in the feed would definitely pollute the water, depleting the dissolved oxygen to the detriment of the fish. Studies will be done to provide an answer to this problem. No Salmonellae were isolated from the fresh paunch and it was decided that this was probably due to the paunch's low pH. Because of the low pH, the material may be safe from contamination by pathogenic bacteria; however, this must be verified. Catfish studies to be conducted at Oklahoma State University are expected to produce reliable and conclusive information on whether dried paunch is suitable as a feed supplement in channel catfish culture. (Rowe-East central)
W78-11336

UNDERGROUND INJECTION ON LIQUID WASTE CAN BE ENVIRONMENTALLY SOUND,
Texas Water Quality Board, Austin.
For primary bibliographic entry see Field 6E.
W78-11338

OCEAN DUMPING.
For primary bibliographic entry see Field 6E.
W78-11358

FATE OF TRACE ELEMENTS IN SEWAGE SLUDGE-AMENDED SOILS,
Dayton Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W78-11363

TOXIC METAL CONCENTRATION OF THE WATER TABLE AS AFFECTED BY POULTRY MANURE,
Delaware Univ., Newark. Dept. of Plant Science.
For primary bibliographic entry see Field 5B.
W78-11370

A MASS BALANCE STUDY OF RECYCLING SECONDARY MUNICIPAL WASTEWATER ON ABANDONED FIELD ECOSYSTEMS,
Michigan State Univ., East Lansing. Dept. of Zoology.
For primary bibliographic entry see Field 5D.
W78-11577

WATER QUALITY AND THE OCCURRENCE OF CHIRONOMUS RIPARIUS MEIGEN (DIPTERA: CHIRONOMIDAE) IN A STREAM RECEIVING SEWAGE EFFLUENT,
Plymouth Polytechnic (England). Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W78-11666

REGION OF DURHAM LEADS WAY WITH SLUDGE DISPOSAL.
Water Pollution Control, Vol 116, No 5, p 22, May-June, 1978.

Descriptors: *Sludge treatment, *Sludge disposal, *Surveys, *Application methods, *Irrigation practices, Incineration, Nutrients, Heavy metals, Landfills, Soil amendments, Waste water treatment, Municipal wastes.

A comprehensive study of sludge disposal techniques is planned for nine sewage treatment plants and six water treatment plants in the region of Durham, Ontario, Canada. The sewage treatment plants have capacities ranging over 0.4-15.0 mgd; the water treatment plants have capacities of 0.7-30.0 mgd. The study will investigate the current sludge handling and disposal techniques used in all the plants and the problems associated with sludge treatment. The nutrient concentrations and metal contents of the individual sludges produced by the treatment plants will be measured and the results compared to guidelines established by the Ministries of Agriculture and Food, Health, and Environment. The final report will evaluate land disposal, landfilling, lagooning, and incineration as singular or combined methods of diposing of sludge from each plant. (Lisk-FIRL)
W78-11738

OIL REFINERY SLUDGE - AN INDUSTRY LOOKS TO LAND CULTIVATION,
For primary bibliographic entry see Field 5D.
W78-11777

CONVERSION OF SULFITE PULPING WASTE TO AN AGRICULTURAL PRODUCT,
Charmin Paper Products Co., Mehoopany PA.
For primary bibliographic entry see Field 5D.
W78-11781

SURVEY OF HUMAN VIRUS OCCURRENCE IN WASTEWATER-RECHARGED GROUNDWATER ON LONG ISLAND,
Brookhaven National Lab., Upton, NY. Dept. of Energy and Environment.
For primary bibliographic entry see Field 5B.
W78-11785

THE EFFECT OF WASTE WATER REUSE IN COLD REGIONS ON LAND TREATMENT SYSTEMS,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 5D.
W78-11787

ELIMINATION OF FECAL COLIFORM BACTERIA FROM SOIL IRRIGATED WITH MUNICIPAL SEWAGE LAGOON EFFLUENT,
Singapore Univ. Dept. of Microbiology.
For primary bibliographic entry see Field 5G.
W78-11788

SLUDGE GAS AN ENERGY SOURCE IN SEWAGE WORKS,
For primary bibliographic entry see Field 5D.
W78-11790

HEALTH EFFECTS OF LAND APPLICATION OF WASTEWATER AND SLUDGE: WHAT ARE THE RISKS,
Texas Univ. at San Antonio. Center for Applied Research and Technology.
For primary bibliographic entry see Field 5D.
W78-11797

INFILTRATION THROUGH SOIL AS A TERTIARY TREATMENT OF SEWAGE EFFLUENT,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
For primary bibliographic entry see Field 5D.
W78-11805

SLUDGE DEWATERING STUDIES AT HYPERION TREATMENT PLANT,
Los Angeles Bureau of Sanitation, CA.
G. T. Ohara, S. K. Raksit, and D. R. Olson.
Journal Water Pollution Control Federation, Vol. 50, No. 5, p 912-925, May, 1978. 9 fig, 9 tab.

Descriptors: *Sludge treatment, *Dewatering, *Drying, *Centrifugation, *Filtration, Polymers, Chemicals, Heat treatment, Sludge disposal, Cost analysis, Waste water treatment, Municipal wastes.

The Los Angeles Bureau of Sanitation investigated sludge treatment and dewatering techniques as an alternative to ocean disposal of the 150 tons sludge with a solids content of 2.5% produced daily. Pilot plant studies covered solid-bowl centrifugation, basket centrifugation, vacuum filtration, drying beds, and pressure filtration. Physical, chemical, and thermal conditioning techniques of sludge treatment were also studied. The most suitable methods were identified by the study as: drying bed or evaporation pond dewatering of chemically-conditioned sludge; solid-bowl centrifugation of chemically-conditioned, thermophilically digested sludge; and basket centrifugation of chemically-conditioned, mesophilically digested sludge. The latter two treatment processes cost $41.40 and $39.50/ton dry solids, respectively, while drying bed treatment cost $22.40/ton dry solids, excluding the cost of required land. (Lisk-FIRL)
W78-11812

TURNING SLUDGE INTO SOIL CONDITIONER SOLVED A CITY'S DISPOSAL PROBLEM,
Water Pollution Control Div., Philadelphia, PA.
F. Senske, and T. Lauletta.
Water and Sewage Works, Vol. 125, No. 7, p 24-26, July, 1978. 2 tab.

Descriptors: *Sludge treatment, *Dewatering, *Anaerobic digestion, *Sludge digestion, *Soil amendments, Sludge disposal, Fertilizers, Nutrients, Heavy metals, Waste water treatment, Municipal wastes.

As an alternative to ocean disposal, sewage sludge from Philadelphia, Pennsylvania, is anaerobically composited, cured, shredded, and given to the public as a soil amendment. Philorganic has a solids content of 60-70%, about 17,000 mg/kg phosphorus, 9,700 mg/kg Kjeldahl nitrogen, 12,100 mg/kg iron, 3,900 mg/kg potassium, and quantities of mercury, cadmium, chromium, copper, lead, manganese, nickel, zinc, potassium, arsenic, vanadium, selenium, and beryllium. Sludge excavated from storage lagoons, containing about 25% solids, is spread in an 8-inch layer, harrowed with an agricultural disc, and scraped into containers; the process requires about 4 wks and produces a sludge containing about 60% solids. The addition of a cleated-belt conveyor shedding unit with a 125 cu yd/hr input capacity produced a more uniform and spreadable product. Fresh sludge is anaerobically composed for 21 days, cured for 20 days, and transported to the shredder for Philorganic production. The shredder automatically removes foreign debris from the sludge and recovers up to 50% of the wood chips being tested as a bulking agent. (Lisk-FIRL)
W78-11815

AERATED-PILE COMPOSTING: A PROMISING NEW ALTERNATIVE FOR DISPOSING OF SEWAGE SLUDGE,
For primary bibliographic entry see Field 5D.
W78-11821

ULTRAFILTRATION MEETS DISCHARGE REGULATIONS AND REDUCES WASTE PUMPOUT,
David W. Taylor Naval Ship Research and Development Center, Annapolis, MD.
For primary bibliographic entry see Field 5D.
W78-11825

LAND DISPOSAL OF TOXIC SUBSTANCES AND WATER-RELATED PROBLEMS,
Energy Resources Co., Inc., Cambridge, MA.
E. Epstein, and R. L. Chaney.
Journal Water Pollution Control Federation, Vol. 50, No. 8, p 2037-2042, August, 1978. 2 tab, 28 ref.

Descriptors: *Sludge disposal, *Application methods, *Heavy metals, *Toxins, *Solubility, DDT, Chelation, Chemical reactions, Acidity, Alkalinity, Soils, Plants growth, Phytotoxicity, Sewage sludge, Sludge digestion, Municipal wastes, Trace elements, Cations, Pathogens, Polychlorinated biphenyls.

The physical and chemical reactions occurring in soils and plants when sludge is applied to land are reviewed. Certain heavy metals become divalent cations in acidic soils; in alkaline or neutral soils, hydroxyl ions are often formed. Soil acidity usually increases the solubility of trace elements and heavy metals, thereby increasing the uptake of these substances by plants. Organic matter may act as a chelating agent when contacted with metal ions in the soil; higher soil cation exchange capacities reduce heavy and toxic metal chelation. Reversion of toxic metals to unavailable chemical forms is controlled by soil pH, phosphate, and organic material contents; soil moisture, temperature, and aeration also control the availability of metals in the soil. Accumulations of heavy metals in plants from the application of sewage sludge, fertilizers, or pesticides can result in phytotoxic effects. Significant amounts of organic chemicals, such as polychlorinated biphenyls, and pesticides, have been found in raw sludge from Michigan and the District of Columbia. Human pathogens have been shown to survive in soils and on plants from less than one day to nearly 7 years; risks associated with these pathogens are significantly reduced when digested or composted sludges are applied to land. (Lisk-FIRL)
W78-11827

LARGE EUNICE HARASSII AUDOUIN AND MILNE-EDWARDS FROM A SLUDGE DISPOSAL AREA,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5C.
W78-11829

WIDER USE OF SEWAGE SLUDGE.
For primary bibliographic entry see Field 5D.
W78-11830

ORGANIC ASSIMILATION CAPACITY OF MAUMEE RIVER ESTUARY AT TOLEDO, OHIO,
Earthview, Inc., Toledo, OH.
For primary bibliographic entry see Field 5G.
W78-11862

STUDY OF FILTER PRESS DEWATERING OF SLUDGE FROM THE EFFLUENT TREATMENT PLANT AT THE SLIVNITSA FIBERBOARD MILL (IZSLEDVANIYA VYRKHU MEKHANICHNOTO OBEZVODIYAVANE NA UTAJKITE OT PRECHISTVATELNATA STANTSIYA NA ZAVODA ZA D'RVESPOVLAKNESTI PLOSKOSTI -- GR. SLIVNITSA, S FILT'R-PRESA),
M. Staneva.
Trudove Vodosnabdyavane, Kanalizatsya, Sanitavna Tekhnika, Vol. 11, No. 2, p 79-89, 1975. 4 fig, 6 ref, 1 tab. English summary.

Descriptors: *Sludge treatment, *Dewatering, *Pulp wastes, Wastes, Industrial wastes, Activated sludge, Sludge, Sludge disposal, Coagulation, Lime, Iron compounds, Chlorides, Sulfates, Wood wastes, Filters, Thermal capacity, Filters, Filtration, Waste treatment, Iron chloride, Iron sulfate, Filter press.

At the Slivnitsa (Bulgaria) wood fiberboard mill, the primary and excess activated sludge separated from the purified effluent is dumped into drying basins. This method is ineffective. Experiments have been conducted with a model of the Soviet FPAKM filter press to determine the possiblity of using this apparatus for dewatering the sludge. The experiments were conducted with thickened excess sludge, and its mixtures with primary sludge and primary sludge from which particles larger than 3-3.5 mm had been removed. The materials to be dewatered were treated with coagulants (ferric chloride and sulfate, or lime, added in amounts of up to 7%, based on sludge dry solids), and wood shavings were added in an amound equal to the dry solids weight to improve the efficiency of the filter. The data obtained indicated that pressure filtration is a suitable dewatering means. Optimum conditions for an efficiency of 23 kg dry solids/sq m/hr include addition of 3.5-4.0% ferric chlorida and a pressure of 7-8 atmospheres. The moisture content of the dewatered sludge under these conditions is 73-75%. The caloific value of the drysolids is 380-4300 kcal/kg. An industrial process for sludge dewatering on the FPAKM filter press (preferably one of 25 sq m surface area instead of two filters 10 sq m each) was developed on the basis of the laboratory data. (Stapinski-IPC)
W78-11921

DISPOSAL OF AEROBICALLY DIGESTED SLUDGE,
Little Blue Valley Sewer District, Independence, MO. Interim Treatment Plant.
For primary bibliographic entry see Field 5D.
W78-11930

TOWN ABANDONS TERTIARY SEWAGE PLANT.
For primary bibliographic entry see Field 5D.
W78-12005

STALLED SLUDGE TALKS SPUR COURT ORDER.
Engineering News-Record, Vol 201, No 4, p 19, July, 1978.

Descriptors: *Sludge disposal, *Biodegradation, *Treatment facilities, *Legal aspects, *Judicial decisions, Ultimate disposal, Negotiations, Sewage sludge, Sludge treatment, Municipal wastes.

The District of Columbia has been ordered by the federal district courts to construct a sludge composting plant to treat the 850 tons/day of wet sludge produced by Washington and three other counties. The city has claimed that a composting facility will produce particulate emissions exceeding federal limits and release a lung disease-related fungus that would present a health hazard to patients in a nursing home 2,000 ft from the site. EPA has reported that no data has yet been presented to support these claims. The sludge is currently transported to the three countries for burial, composting, or land application; negotiations had centered on the ultimate location for disposal of the sludge. The $2 million composting facility will be constructed at Washington's Blue Plains waste water treatment plant. (Lisk-FIRL)
W78-12031

AQUATIC HABITAT OF COAL AND BENTONITE CLAY STRIP MINE PONDS IN THE NORTHERN GREAT PLAINS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
For primary bibliographic entry see Field 2H.
W78-12038

RUNOFF AS A FACTOR IN EUTROPHICATION OF SURFACE WATERS IN RELATION TO PHOSPHORUS MANURING,
Institute for Soil Fertility, Groningen (Netherlands).
G. J. Kolenbrander.
Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the 'Instituto Sperimentale Agronomico', Modena, Italy, Sept. 20-24, 1976, p 181-196. (1976) 2 fig, 6 tab, 14 ref.

Descriptors: *Water pollution sources, Eutrophication, *Phosphorus, *Agricultural runoff, *Farm wastes, *Waste disposal, *Land application, Netherlands.

Because phosphorus is the only element essential to algal growth, the phosphorus load to Holland's surface waters needs to be reduced in order to improve water quality. The phosphorus load resulting from runoff from agricultural land receiving manure fertilization is examined. In Holland, runoff during the growing season is of minor importance because the water storage capacity of the topsoil is usually sufficient to absorb rainfall amounting to 20-35 mm/day. Only arable and grassland clay soils that are impermeable or poorly drained may result in some runoff on 1-5 days a year. When the soil is frozen during the winter, about 25 mm of precipitation may accumulate and reach surface waters in the spring as meltwater. Such runoff may amount to 0.04 - 0.08 kg Pt per ha per year, depending upon the soil type and the amount of phosphorus applied. Manure surpluses produced in regions with sandy soils should be utilized on marine clay soils because they have a high phosphorus adsoption capacity. Winter application of manure to grassland must be considered a potential danger to the quality of surface water. (Rowe-East Central)
W78-12056

PHOSPHORUS COMPOUNDS IN PIG SLURRY AND THEIR RETENTION IN THE SOIL,
Institute for Soil Fertility, Groningen (Netherlands).
R. G. Gerritse.
Utilization of Manure by Land Spreading, A Seminar on the EEC Programme of Co-ordination of Research on Effluents, organized by the 'Istituto Sperimentale Agronomico,' Modena, Italy, Sept. 20-24, 1976, p. 257-266. (1976) 2 fig, 4 tab, 8 ref.

Descriptors: *Slurries, Phosphorus compounds, Water pollution, Groundwater pollution, Soil profiles, *Farm wastes, *Swine wastes, Land application, Soil adsorption, *Soil retention(Wastes).

Phosphorus in animal wastes, which in some agricultural areas are applied to the soil in excessive amounts, is a potential pollutant of surface and groundwater. Retention of inorganic phosphate in the soil is determined by the adsorption characteristics of the soil. The main factors influencing adsorption in the soil are organic matter, aluminum and iron content, specific surface area of the soil and soil pH. To be able to evaluate inorganic phosphorus movement in the soil properly, columns of undisturbed soil of 80 cm length have been set up under unsaturated flow conditions and treated with the equivalent of 800 m3/ha of pig slurry (7% dry matter). Phosphorus, chloride and phosphatase activity are monitored in the column effluent, resulting from a simulated rainfall of about 1 cm/day. Preliminary results indicate that organic phosphorus compounds move almost as fast as chloride. Chloride breakthrough in the column effluents occurred after one montgh and organic phosphorus broke through less than a week later, and reached concentrations of 1-2 mg P/litre. The organic phosphorus compounds in the effluent were mainly (70-80%) of high molecular weight, as has also been found for organic P in solution in pig slurry. Inorganic P in the effluent has not significantly increased and is of the order of 0.001-0.1 mg P/liter. After about 1-2 years the soil profile will be analyzed for inorganic and organic phosphorus and phosphatase activity. On the basis of various parameters, a computer model of phosphate transport in the column will be made and the results of simulation compared with practice. (Merryman-East Central)
W78-12057

WATER POLLUTION BY LIVESTOCK EFFLUENTS,
Institut de Recherches Chimques, Tervuren (Belgium).
For primary bibliographic entry see Field 5B.
W78-12058

AEROBIC TREATMENT IN RELATION TO LAND APPLICATION OF SLURRY,
West of Scotland Agricultural Coll., Auchincruive, (Scotland).
For primary bibliographic entry see Field 5D.
W78-12059

FARMYARD MANURE AND CROP PRODUCTION IN DENMARK,
Askov Experimental Station (Denmark).
For primary bibliographic entry see Field 5G.
W78-12060

PATHOGEN CONSIDERATIONS FOR LAND APPLICATION OF HUMAN AND DOMESTIC ANIMAL WASTES,
Agricultural Research Service, Beltsville, MD.
J. D. Menzies.
In: Soils for Management of Organic Wastes and Waste Waters, Chapter 22, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Madison, Wisconsin, 1977, p 574-585. 17 ref.

Descriptors: *Farm wastes, Municipal wastes, Pathogenic bacteria, Public health, *Land application, Animal health, Waste disposal.

Recycling of animal manures directly in pasturing or by spreading manure from barns and feedlots on the land is an historically accepted practice. The land is also being used more and more for disposal of municipal wastes. Organic wastes from human or domestic animals inevitably contain pathogens. Consequently, certain safeguards should be observed. Basic guidelines for applica-

tion of municipal wastes are: (1) Present regulations protecting domestic water supplies should be maintained. (2) In using sewage sludges on land, properly operated anaerobic digestion, secondary activation, lagooning, or liming to pH 11.5 or above should be sufficient treatment for reducing pathogens to a safe level. (3) Untreated raw sludges and raw effluent water should not be used in food crop production until more is known about this hazard. (4) Composted sludges should be considered to be sufficiently free of pathogens to be used for crop and food production. (5) Raw sewage effluent should be safe for sprinkling on land where public access is controlled and suitable buffer zones are provided to take care of aerosol drift. (6) Effluent from properly operated secondary treatment plants or lagoon systems should be considered safe to use on grains, forage and other animal feed crops. (7) Sewage effluent should not be sprinkled on human food crops. (8) Surface application of sewage sludges or effluent should be done with reasonable precautions to prevent surface runoff into open water. In terms of land application of animal wastes, a number of studies have shown that it is a good precautionary practice to restrict animals from sprayed pastures for a week or 10 days of sunny weather after application. This exposure to heat, ultraviolet radiation, and drying is generally lethal to Salmonella, fecal coliforms, and probably viruses. (Merryman-East Central)
W78-12062

LAND UTILIZATION AND DISPOSAL OF ORGANIC WASTES IN ARID REGIONS,
Arizona Univ., Tucson.
W. H. Fuller, and T. C. Tucker.
In: Soils for Management of Organic Wastes and Waste Waters, Chapter 17, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Madison, Wisconsin, 1977, p 472-489. 6 tab, 31 ref.

Descriptors: *Farm wastes, Municipal wastes, Industrial wastes, Arid lands, Environmental effects, Air pollution, Ground water pollution, *Waste disposal, *Organic wastes, Plant wastes, *Land application.

Aridity may be described as a comparison between water supply and water need. Water supply is relatively easy to measure. Water need, which refers primarily to potential evapotranspiration, is more difficult to evaluate. Chemically, arid land soils are neutral to alkaline in pH and high in salts. Animal manures in arid regions probably differ from those in humid regions more than other waste materials. Moisture content of wastes and also the leaching associated with rainfall are less prominent in arid than in humid lands. The custom of housing animals in exposed and unpaved corrals and feedlots results in the manures mixing with sand and soil. For manures to be beneficially used on soils in crop production, special management practices must be used to avoid the following problems: (1) excessive salt hazard, (2) high loading rates, (3) accumulation of unfavorable levels of trace and heavy metals, (4) potential disease problems, and (5) high levels of Na and K in proportion to Ca plus Mg. The nature of other wastes (including plant wastes, municipal solid wastes, sludges, city effluent, and industry waste streams) must also be taken into account in arid regions. At present, organic waste and waste water management in arid region soils of the United States is based on limited research. Water pollution and air pollution potential must be examined. While many of these wastes and waste waters may be beneficially applied to arid lands due to nutrient and moisture content, wise management systems must be utilized to avoid any detrimental conditions that may arise from such applications. (Merryman-East Central)
W78-12063

SLURRY PROBLEMS IN RELATION TO POLLUTION OF SURFACE WATERS,
Queen's Univ., Belfast (Northern Ireland).
For primary bibliographic entry see Field 5G.
W78-12067

DAIRY WASTE DISPOSAL,
For primary bibliographic entry see Field 5G.
W78-12068

GUIDELINES FOR MANURE USE AND DISPOSAL IN THE WESTERN REGION, USA,
Agricultural Research Service, Brwaley, CA. Imperial Valley Conservation Research Center.
B. Meek, L. Chesnin, W. Fuller, R. Miller, and D. Turner.
Bulletin 814, Agricultural Research Center, Washington State University, 1975. 18 p, 10 fig, 21 tab, 50 ref.

Descriptors: Chemical properties, Physical properties, Biological properties, Water pollution, Odor, Dust, Salinity, *Farm wastes, *Waste disposal, Western United States, *Land application, Flies, Ammonia toxicity, Guidelines.

Although the variety of climates in the Western Region of the United States suggests a variety of techniques for pollution control and effective manure handling, the great proportion of manure is being recycled to the land as fertilizer and soil amendments. Guidelines for land application are given which will encourage the efficient use of manures in crop production. Physical, chemical, and biological properties of various types of manure are discussed. Water pollution in relation to land application of manures is discussed. Problems associated with overuse (salinity, ammonia toxicity, and oversupply of elements and trace elements) are examined. Guidelines are given for applying manure to warm irrigated regions (more than 6,000 annual degree days), to cold irrigated regions (less than 6,000 annual degree days), to dryland regions, and to humid regions. (Merryman-East Central)
W78-12074

WHAT TO DO WITH ANIMAL WASTES ... RECYCLING,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 5G.
W78-12085

USE OF FLUID COWSHED MANURE IN FISH PONDS,
Agriculture Research Organization, Dor (Israel). Fish and Aquaculture Station.
G. L. Schroeder.
Bamidgeh, Vol. 26, No. 3, p 84-96, 1974. 6 fig, 5 tab, 4 ref.

Descriptors: Fish ponds, Fishkills, Biochemical oxygen demand, Chemical oxygen demand, Dissolved oxygen, *Farm wastes, *Israel, Refeeding, Cattle manure, Fish growth, Dry matter.

Manure is often used as a fertilizer for fish ponds. The decay of the manure in the pond consumes dissolved oxygen (D.O.) and can lower the D.O. to a level at which fish kill by anoxia occurs. To determine the effects of fluid cowshed manure on fish ponds, the cycles of D.O., abundance and protein content of natural foods, and fish growth were studied in a group of ponds receiving varied amounts of manure. The manure was analysed for 1 day and 5 day biological oxygen demand (BOD1, BOD5) at pond temperature, chemical oxygen demand (COD), and percent dry matter. No foods or fertilizers other than manure were added to the ponds. Determining BOD1 of the manure at pond temperature consistently allowed prediction of the maximum amount of oxygen that decay of manure would use and the maximum overnight reduction of D.O. in the pond water due to the added manure. This permitted calculation of the amount of manure that could be added to a pond without hazard of causing anoxia. For a given source of manure, the percent of dry matter was a fair indicator of BOD1. Abundance of natural foods (zooplankton and chironomides) was greater in ponds receiving manure than in non-manured ponds. The zooplankton had a 56% protein content on a dry weight basis. For rates of about 5,000 fish per hectare preliminary data indicate that growth of carp was 25% to 100% faster in manured ponds than in non-manured ponds. With no supplemental food, in manured ponds, carp stocked at 18 gm averaged a growth rate of 3.3 gm/day for 40 days during the summer. Carp stocked at 180 gm averaged a growth of 4.0 gm/day during March. (East Central Univ)
W78-12088

NONPOINT POLLUTION CONTROL FOR WINTERING RANGE CATTLE,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-12089

CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE,
Colorado State Univ., Fort Collins.
J. L. Smith, D. B. McWhorter, and R. C. Ward.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 350, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-600/2-77-117, June, 1977. 47 p. 11 fig, 15 tab, 4 ref.

Descriptors: Liquid wastes, Fertilizers, Groundwater pollution, Nutrients, Salts, Heavy metals, Odor, Insects, Agricultural runoff, Aesthetics, Economics, *Farm wastes, *Waste disposal, *Dairy wastes, *Injection, Bacteria, Site selection.

The research has involved the development and evaluation of an efficient, economical, continuous subsurface injection machine. The application site was instrumented so the quality of water percolating beneath the injection zone could be measured. Wells located around the sites were used to monitor groundwater quality. Soil samples were taken periodically to determine nutrients, salts, heavy metal concentrations, and bacteria movement and survival. Major environmental problems were increased soil salinity and movement of fecal coliform to the groundwater. Both of these problems can be eliminated by proper management and site selection. Subsurface injection is economically feasible when compared with other methods of land application. Although capital costs are greater for subsurface injection, labor costs are significantly reduced. Other advantages of subsurface injection are elimination of odors, insects, and visual pollution and minimization of runoff pollution. (East Central)
W78-12092

PROCESS FOR CONDITIONING SEWAGE SLUDGE.
For primary bibliographic entry see Field 5D.
W78-12098

5F. Water Treatment and Quality Alteration

THE DULUTH EXPERIENCE--ASBESTOS, WATER, AND THE PUBLIC,
Minnesota Dept. of Water and Gas, Duluth.
D. L. Peterson.
Supplementary notes: Journal of the American Water Works Association, Vol. 70, No. 1, p. 24-28 (January, 1978).

Descriptors: *Minnesota, *Lake Superior, *Asbestos, *Water pollution treatment, Utilities, Oligotrophy, Water sources, Filtration, Construction, Potable water, Pollutant identification, Municipal waters.

In 1973 the Environmental Protection Agency (EPA) announced the finding of numerous asbestos-like particles in Duluth tap water which originated from Lake Superior. The EPA advised residents to find an alternative source of drinking water since it was feared the particles might be carcinogenic. The amosite fibers that were found in an unsafe concentration seem to have originated from the dumping of tailings from a taconite-iron-ore benefication plant. The discovery spurred city officials to begin planning of a conventional filter plant to alleviate the problem. After an initial deadlock on the question of which filteration system to use, the EPA conducted tests and then recommended a process that would achieve acceptable results. The article chronicles various actions taken in the courts and the predictable public outcry concerning the crisis. The difficulties inherent in the financing of the new water treatment plants are discussed along with various construction scheduling problems encountered prior to final completion. The article stresses the inability of the public to accept the necessary time delays in dealing with a problem of this magnitude. (Quarles-Florida).
W78-11321

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN: SUMMARY REPORT.
Army Engineers District, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-11475

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN--APPENDIX C: PLAN FORMULATION.
Army Engineers District, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-11478

WASTEWATER MANAGEMENT STUDY CHICAGO SOUTH END OF LAKE MICHIGAN--APPENDIX D: DESCRIPTION AND COST OF ALTERNATIVES.
Army Engineers District, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-11479

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MICHIGAN--APPENDIX G: VALUATION.
Corps of Engineers, Chicago, IL. Chicago District.
For primary bibliographic entry see Field 5D.
W78-11481

COLD-CLIMATE WATER/WASTEWATER TRANSPORTATION AND TREATMENT -- A BIBLIOGRAPHY,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5D.
W78-11574

DEVICE FOR REGULATING DRINKING WATER,
Okazaki Mfg., Co. Ltd., Kawagoe (Japan).
T. Okazaki.
U.S. Patent No. 4,077,862, 12 p, 12 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 968, no 1, p 274, March 7, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, Potable water, Electrolysis, Electrodes, Water softening.

A device for regulating drinking water comprises an electrolyzer which is divided into a negative electrode chamber and a positive electrode chamber by an unglazed protion. Positive and negative electrodes are energized by direct current for a prescribed period of time to separate water into two components having hydroxyl radical in different densities by electrolysis and electroendosmose. A heating element in the hollow space of the negative electrode warms the water in the electrolyzer at each time of electrolysis and results in water softening. (Sinha - OEIS)
W78-11939

TREATMENT OF SULFIDE-BEARING WATERS WITH CHLORINE DIOXIDE,
Olin Corp., New Haven, CT. (Assignee).
C. I. Smeck.
U.S. Patent No. 4,077,879, 7 p, 3 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 968, No 1, p 279, March 7, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, Taste, Odor, Water pollution effects, Sulfides, Petroleum industry.

Naturally occurring taste, odor and solids problems are often found in water systems. One particularly difficult water system problem involves the removal of various sulfide compounds which are generally undesirable for most water uses. In addition to the putrid odor problems which occur with the presence of sulfides, these sulfides often cause serious disruption to industries using sulfide-containing water systems due to sulfide compound build-up and blockage. The sulfides are particularly problematic in systems containing sulfate-reducing bacteria which feed on sulfate compounds and produce the undesirable sulfides. It has now been discovered that if chlorine dioxide is added in specified critical amounts and at critical rates of addition free sulfur formation is avoided and sulfide content is reduced (and also a reduction or removal of the problem bacteria, if present). (Sinha - OEIS)
W78-11941

PROCESS FOR THE PURIFICATION OF INDUSTRIAL EFFLUENTS,
CIBA-GEIGY Corp., Ardsley, NY. (Assignee).
J. Haase, Q. Bowes, and R. F. Wurster.
U.S. Patent No. 4,079,001, 10 p, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 968, No 2, p 653, March 14, 1978.

Descriptors: *Patents, *Water purification, *Water pollution treatment, *Waste water treatment, Industrial wastes, Color, Bleaching wastes, Adsorption, Water reuse.

A process is provided for the purification of industrial effluents, in particular the decolorisation of waste water occurring in the textile, paper and leather industry and in the manufacture of fluorescent brighteners and dyes, for example filtrates, residual liquors, rinsing and wash waters. The process consists in bringing the effluents into contact with an adsorption material that contains a carrier which has been pretreated with a precipitate of a basic, nitrogenous polymeric compound with an activated clay mineral. The effluents to be purified are brought in undiluted form into contact with the adsorption material which can be used after a pH adjustment, e.g. from 2 to 7, especially 3 to 5. On account of the broad applicability of the adsorption material, it is possible to meet the present ever more urgent demand for saving fresh water by a partial to complete recirculatin of residual or waste liquors. (Sinha - OEIS)
W78-11945

HEALTH ASPECTS OF WATER REUSE IN CALIFORNIA,
California State Dept. of Health, Berkeley.
J. Crook.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 104, No EE4, p 601-610, August 1978. 1 fig, 1 tab, 19 ref.

Descriptors: *Water reuse, *Waste water(Pollution), *Sewage treatment, *Health hazards, *Public health, Standards, Water quality, Reclamation, Environmental engineering, California, Regulation, Disease.

The activities of the State of California Department of Health pertaining to wastewater reclamation and reuse are considered. The historical sequence of regulation development in California and the rationale for specific policies and standards deemed necessary to assure public health protection are described, as is the current status of reuse in terms of numbers of wastewater reclamation facilities, types of reuse, and quantities of wastewater reused. Also, a relatively poor record of sewage treatment plant reliability is documented. The potential for human illness or disease from chemical and biological contaminants associated with wastewater reclamation is presented, both from the standpoint of water quality and operational procedures. The health risks associated with direct reuse for potable purposes are presented, with emphasis on treatment, reliability, and potential chronic health effects attributable to trace organic constituents. (Bell-Cornell)
W78-12044

TRIHALOMETHANES AND VIRUSES IN A WATER SUPPLY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-12045

5G. Water Quality Control

THE PORT OF OAKLAND DECISION: CALIFORNIA OIL SPILL LEGISLATION GETS WATERED DOWN,
For primary bibliographic entry see Field 6E.
W78-11301

EXISTING WATER LAWS AND INDUSTRY PRACTICES: THEIR CONTRIBUTION TO THE WASTE OF WATER,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 6E.
W78-11302

OIL POLLUTION LAW AND THE LIMITATION OF LIABILITY ACT: A MURKY SEA FOR CLAIMANTS AGAINST VESSELS,
Kelley, Drye and Warren, New York.
For primary bibliographic entry see Field 6E.
W78-11305

A MODEL FOR RUNOFF OF PESTICIDES FROM SMALL UPLAND WATERSHEDS,
Agricultural Research Service, Watkinsville, GA.
For primary bibliographic entry see Field 5B.
W78-11308

OIL AND WATER,
For primary bibliographic entry see Field 6E.
W78-11311

REFLECTIONS ON WASHINGTON'S COASTAL ZONE MANAGEMENT PROGRAM,
Washington State Dept. of Ecology, Olympia. Shoreline Div.
For primary bibliographic entry see Field 6E.
W78-11313

COMMON LAW V. STATUTORY POLLUTION ABATEMENT: THE TEXAS ATTORNEY GENERAL'S DILEMMA,
For primary bibliographic entry see Field 6E.

W78-11314

POLYCHLORINATED BIPHENYLS TOXIC POLLUTANT EFFLUENT STANDARDS,
Environmental Protection Agency, Washington, DC.
Federal Register, Vol. 42, No. 22, p. 6532-6555 (February 2, 1977).

Descriptors: *Toxins, *Polychlorinated biphenyl, *Water pollution effects, Administrative decisions, *Aquatic environment, Chemicals, Pollutants, Toxicity, Water pollution effects, Administrative decisions, *Aquatic environment, Chemicals, Pollutants, Toxicity, Water pollution, Public health, Chemical wastes, Inorganic compounds, Industrial wastes, Pollutant identification, Water pollution sources, Administrative agencies, Regulations, Federal government, Federal Water pollution control act, Decision making.

In order to meet requirements of the amended Federal Water Pollution Control Act, the Environmental Protection Agency (EPA) has prohibited the discharge of Polychlorinated Biphenyls (PCBs). PCBs are used primarily as insulating fluids in electrical equipment. However, substitutes are available and are being developed. Control technology is also available. Before reaching the decision to prohibit discharge, the EPA conducted comprehensive studies on PCBs. Toxic or adverse effects were found in bacteria, phytoplankton, Fish and aquatic invertbrates, birds, and mammals. Very low exposure was sufficient to cause toxic effects in mammals. These effects have relevance for humans. PCBs have been implicated as a cause of the occupational disease chlorance, and have been associated with a number of carcinogenic effects. among their physical properties, PCBs are resistant to metabolic degradation and have a long life in the environment. They are transported in solution, in the air with vapor, or in the tissues of animals. They also have the tendency to be bioaccumulated or bioconcentrated in the tissues of aquatic organisms, so that the level of PCBs in their bodies is higher than that in the ambient water. (Malefatto-Florida)
W78-11319

A CRITICAL APPRAISAL OF PROPOSED CHANGES TO THE 1972 WATER POLLUTION CONTROL ACT,
New York State Dept. of Environmental Conservation, Albany.
H. H. Bagley.
Civil Engineering--American Society of Civil Engineers, Vol. 47, No. 11, p. 66-69 (November, 1977).

Descriptors: *Federal Water Pollution Control Act, *Future planning(Projected), *Water pollution control, *Water quality control, Permits, Standards, Administration, Economic efficiency, Management, Non-structural alternatives, Regional development, Governmental interrelations.

Modifications of the 1972 Water Pollution Control Act (WPCA) will likely be influenced by proposals from the federal Environmental Protection Agency (EPA), the National Commission on Water Quality (NCWQ) Report, and the 1976 Needs Survey. EPA proposals have included limiting federal grant eleigibility for local sewage facilities, imposing 'non-compliance fees' on violating private point source discharges and transferring part of EPA's construction grants management functions to the states. Of these proposals the author asserts that limiting federal grants would defeat sewage facilities construction plans, that 'non-compliance fees' would not be as economically beneficial as currently mandated pollution abatement measures, and the state construction grant management would speed up processing and avoid duplication. The NCWQ proposal to extend the 1983 'best available technology' goal for treatment of industrial discharges is unnecessary, according to the author. However, the NCWQ recommendation to provide stable federal funding for local treatment works was favored. Two other suggestions offered in the article were that the method of raising revenue for operation and maintenance of local sewage treatment works should be left to local option, and that the user charge requirement should be deleted from the WPCA. (Baumback-Florida).
W78-11322

A MULTI-FACETED, MULTI-AGENCY DETECTION, RESEARCH AND ENFORCEMENT PROGRAM.
For primary bibliographic entry see Field 6E.
W78-11324

ORE MINING AND DRESSING EFFLUENT GUIDELINES--TO BPT OR NOT TO BPT,
American Mining Congress, Washington, DC.
J. R. Walpole.
Rocky Mountain Mineral Law Institute, Vol. 23, p. 353-384 (1977).

Descriptors: *Federal Water Pollution Control Act, *Design standards, *Monitoring, *Regulation, Administrative agencies, Standards, Water quality standards, Permits, Law enforcement, Institutional constraints, Cost-benefit analysis, Industrial wastes.

In 1973 the Environmental Protection Agency (EPA) promulgated effluent guidelines, pursuant to the Federal Water Pollution Control Act, for the ore mining and dressing point source category. It was then apparent that tremendous differences of opinion existed between the EPA and the regulated industries regarding the accuracy of essential technical information and calculations. Eleven lawsuits challenging the regulations were filed. Consequently, the EPA suspended its regulations in 1976 after meeting with industry representatives. At the writing time of this article, the EPA had indicated its intent to revise the ore mining regulations, although it still had not promulgated revised guidelines. This paper reviewed how the regulations were developed, including the activities of the EPA, consulting firms hired by the Agency and the mining companies affected by the regulations. One section of the paper proposed guidelines for regulated industries. Suggestions included: (1) when a large segment of the industry is affected, a central organization should be designated to monitor the program in detail; (2) industry representatives should encourage meetings and discussions with EPA personnal; and (3) comprehensive industry comments should be submitted to the EPA when allowed. (Baumbach-Florida).
W78-11326

QUALITY V. QUANTITY: THE FEDERAL WATER POLLUTION CONTROL ACT'S QUIET REVOLUTION IN WESTERN WATER RIGHTS ADMINISTRATION,
Debevoise and Libeman, Washington, DC.
J. C. Muys.
Rocky Mountain Mineral Law Institute, Vol. 23, p. 1013-1040 (1977).

Descriptors: *Federal Water Pollution Control Act, *Governmental interrelations, *Water supply, *Water rights, Legislation, Water pollution state jurisdiction, Prior appropriation, Decision making, Cost-benefit analysis, Water demand, Water utilization.

The 1972 Federal Water Pollution Control Act (FWPCA) Amendments have posed problems for administration of water rights in the arid western states. Effluent guidelines established by the Environmental Protection Agency (EPA) for thermal discharge have necessitated the use of water cooling systems which consume significantly more water for their operation than do other cooling systems. The author proposes that the existing local agencies which administer the non-point source pollution control program as specified by the FWPCA, should also be permitted to vary EPA proposed effluent limitations. The local agency would be able to balance local considerations such as lack of water against thermal and other water quality needs. Another problem concerns how to accomodate a particular effluent limitation into the schedule of water rights appropriations where it is agreed that the particular limitation is appropriate even though it increases consumptive use. The author asserts that users should have to aquire the increased water rights either by : (1) a new appropriation where unappropriated water is available; (2) purchase; or (3) condemnation. (Baumbach-Florida).
W78-11328

ENFORCING THE FEDERAL WATER RESOURCE SERVITUDE ON SUBMERGED AND RIPARIAN LANDS,
Department of Justice, Raleigh, NC. Eastern Div.
For primary bibliographic entry see Field 6E.
W78-11334

CHANGES IN SEEPAGE RATE FROM AN UNLINED CATTLE WASTE DIGESTION POND,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
F. E. Robinson.
Transactions of the ASAE, V. 16, No. 1, p. 95-96, Jan.-Feb., 1973. 2 fig., 7 ref.

Descriptors: *Seepage, Conductivity, Nitrates, *Farm wastes, *Cattle wastes, *Waste digestion pond, *Groundwater pollution.

Solid and liquid wastes from 24 cattle were emptied into an unlined pit that was approximately 4 feet deep, 19 feet wide, and 77 feet long. The soil in the area of this pit was alluvial with layers of clay loam, silty clay loam, and clay to 5.5 feet, with a water saturated 6-inch of fine sandy loam at the 5.5 feet depth. The water table in the sand strata was sampled for conductivity and nitrate content prior to filling the pond. Sampling procedures were set up which allowed a comparison of conductivity and nitrate levels in the pond and the sand strata beneath the pond after the pond was put into use. The initial 4.4 in./day seepage rate dropped to 0.220 in. in 3 months and to 0.119 in./day in 6 months. Dilution of the groundwater around the pond was most rapid during the first 3 weeks, suggesting that the major seepage rate reduction took place during this period. Nitrate addition to the groundwater was about 0.427 lb/animal/year after 3 months and about 0.259 lb after 6 months. (Merryman-East Central).
W78-11335

HOUSE-SENATE COMMITTEE COMPROMISES ON PL 92-500,
For primary bibliographic entry see Field 6E.
W78-11337

THE IMPLICATIONS OF SURFACE AND SUBSURFACE MINING POLICY FOR GROUNDWATER PROTECTION IN PENNSYLVANIA,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Div. of Mine Drainage Control and Reclamation.
D. R. Thompson.
Water and Sewage Works, Vol. 124, No. 12, p. 70-71 (December, 1977).

Descriptors: *Pennsylvania, *Groundwater, *Water pollution treatment, *Acid mine water, Water quality control, Water pollution, Coal mine wastes, Mine drainage, Legislation, Judicial decisions, Dewatering, Water quality standards.

Pennsylvania is living with problems created 150 years ago. Most of its anthracite mining occurred before its geology and groundwater systems were understood. Today old mines divert groundwater through a maze of complex, interconnected tunnels. At present it is difficult to determine the impact on groundwater of past and present mining efforts. More geochemical and hydrological studies are needed. Several state and federal laws currently deal with the problems of pollution from coal mine acid drainage. As of 1965, all coal mines have been required to have permits based upon approval of their drainage and waste disposal systems. In 1970, the Pennsylvania legislature dictated that all mines had to be sealed water tight upon closure. Two later U.S. Supreme Court decisions stated that an operating mine was responsible for all acid mine drainage into Pennsylvania waterways, including mine drainage from abandoned mines. Other policies directed at the coal industry include: (1) sub-water table mines must be dewatered, with the discharged water being treated where needed; (2) water accumulated in surface mines must be pumped and treated; and (3) all discharges from operation must meet the water quality criteria of recipient streams. (Baumbach-Florida)
W78-11339

THE SELECTION AND MANAGEMENT OF FEEDLOT SITES AND LAND DISPOSAL OF ANIMAL WASTE IN BOISE VALLEY, IDAHO,
Boise State Univ., ID.
L. L. Mink, C. M. Gilmour, S. M. Beck, J. H. Milligan, and R. L. Braun.
In: Proceedings of the Third National Ground Water Quality Symposium, Environmental Protection Agency Report EPA-600/9-77-014, June, 1977, p 55-69. 11 fig, 9 tab, 30 ref.

Descriptors: *Feedlots, *Management, Chemical properties, Soil profiles, *Sites, *Land disposal, *Idaho, *Groundwater pollution, Application rates.

Environmental effects of feedlot location and related land disposal operations can be minimized if proper knowledge of hazardous conditions are known and appropriate protective steps taken. Common guidelines often do not apply because of differing physical characteristics of local areas. Analyses of various parameters within a soil profile beneath a feedlot revealed none of the chemical constituents present in high concentrations below the 23-foot depth. In areas where shallow ground water was less than 5 feet from the surface, the ground water was found to be affected by the feedlot. Other hazardous areas in feedlot location are flood-prone areas, areas of surface bedrock, and areas of excessive slope. For land disposal operations, loading rates and frequency of application of feedlot waste should be adjusted in accordance with soil permeability, depth to ground water, and irrigation practices to minimize detrimental effects on ground-water quality. (East Central)
W78-11340

PHOSPHORUS LOSS BY STREAM TRANSPORT FROM A RURAL WATERSHED: QUANTITIES, PROCESSES, AND SOURCES,
Pennsylvania Univ., Philadelphia.
For primary bibliographic entry see Field 5B.
W78-11341

REMEDIES IN ADMIRALTY FOR OIL POLLUTION,
Duncan, Brown, Weinberg and Palmer, Washington, DC.
S. E. Roady.
Florida State University Law Review, Vol. 5, No. 3, p 361-380 (Summer, 1977).

Descriptors: *Oil spills, *Remedies, *Penalties(Legal), *Legislation, Oceans, Oil pollution, Florida, Jurisdiction, Trespass, Negligence, Legal aspects, Damages.

The recent spate of oil spills has increased the possibility of shoreline property owners seeking to recover damages for tankers' oil pollution. This article attempts to explore the admiralty remedies available to owners residing in states which lack the statutory protection afforded Floridians by the Florida Pollutant Spill Prevention and Control Act. After reviewing relevant cases, it is concluded that the current state of admiralty law should spur concerned beachowners in Georgia, Alabama, California and Louisiana to sponsor legislation similar to the Florida act. An examination of current admiralty law reveals that modern identification techniques, coupled with the availability of the legal doctrine of 'res ipsa loquitur,' increase the probability of a private party successfully establishing liability on the part of the offending vessel and its owners. However, the prospects of avoiding limitation of liability problems remain uncertain. Unless the claimant can rely upon a statutory right of direct action against the insurer of the vessel, the cause of action may not be successful. The article also examines the federal and other states' responses to the problem. (Quarles-Florida)
W78-11342

DESKOVICH V. WATER POLICY AND SUPPLY COUNCIL (SANITARY LANDFILL SUBJECT TO AGENCY REGULATION).
For primary bibliographic entry see Field 6E.
W78-11346

PARKING MALL ASSOCIATES V. WATER POLICY AND SUPPLY COUNCIL OF THE DIVISION OF WATER RESOURCES OF THE DEPARTMENT OF ENVIRONMENTAL PROTECTION (ADMINISTRATIVE AGENCY CAN ASSESS TIME LIMITS FOR COMPLIANCE WITH PERMIT CONDITIONS).
For primary bibliographic entry see Field 6E.
W78-11347

UNITED STATES OF AMERICA V. SLADE, INCORPORATED (OWNER OF OIL SPILLING TANKER ASSESSED CIVIL PENALTIES AND CLEANUP COSTS).
For primary bibliographic entry see Field 6E.
W78-11349

CHICAGO, MILWAUKEE, ST. PAUL AND PACIFIC RAILROAD COMPANY V. UNITED STATES (CLEANUP COSTS OF OIL SPILL CAUSED BY BURGLAR RECOVERABLE FROM UNITED STATES).
For primary bibliographic entry see Field 6E.
W78-11351

MOE V. DIVISION OF STATE LANDS (THE POWER OF THE DIVISION OF STATE LANDS TO GRANT FILL PERMITS FOR SUBMERGED LANDS).
For primary bibliographic entry see Field 6E.
W78-11355

WETLANDS AND RIPARIAN RIGHTS.
For primary bibliographic entry see Field 6E.
W78-11356

STATE, DEPARTMENT OF ENVIRONMENTAL PROTECTION V. EXXON CORP. (LANDOWNER'S LIABILITY FOR PREVIOUS USE OF THE LAND).
For primary bibliographic entry see Field 6E.
W78-11360

MODELING PHOSPHORUS CYCLING IN LAKE SEBASTICOOK NEWPORT, MAINE,
Maine Univ. at Orono. Dept. of Mathematics.
For primary bibliographic entry see Field 5C.
W78-11368

VIRAL CONTROL OF NUISANCE BLUE-GREEN ALGAE,
California Univ., Riverside. Dept. of Plant Pathology.
P. R. Desjardins, M. B. Barkley, S. A. Swiecki, and S. N. West.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 052. Price codes: A03 in paper copy, A01 in microfiche. Contribution 169, Water Resources Center, University of California, Davis, May 1978 (California Water Resources Center Project UCAL-WRC-W-496) 29 p, 12 fig, 1 tab, 58 ref. OWRT B-176-CAL(4).

Descriptors: *Cyanophyta, *Algal control, Aquatic algae, Biocontrol, Nuisance algae, Methodology, Evaporation, Filtration, Viral control, Water pollution control.

The primary goals have been the development of a method for the purification of high titers of cyanophages and the development of methods for the concentration of cyanophages from large volumes of blue-green algae culture lysates or natural waters. The purification method developed is very effective for the two cyanophages studied (AS-1 and LPP-1) as it provides greater yields per volume of culture lysates than methods previously reported. It is a relatively simple method involving clarification of the culture lysate with bentonite, concentration by rotary evaporation and a final step utilizing density gradient centrifugation. Two concentration methods, rotary evaporation and high flow molecular filtration were most useful for isolating cyanophages from large volumes of clarified culture lysates or low ionic strength solutions. Although the virus recovery efficiency of these methods was not as high as desired, cyanophages recovered by these methos were infectious and stable. These methods have yet to be tested using 'natural' waters. (Snyder-Calif, Davis).
W78-11369

SELENIUM IN SOUTH DAKOTA GROUND AND SURFACE WATER,
Geological Survey, Vermillion, SD.
For primary bibliographic entry see Field 5A.
W78-11371

UNCERTAINTIES IN LAKE MANAGEMENT,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 6A.
W78-11398

REGIONALIZATION OF WATER MANAGEMENT: A REVOLUTION IN ENGLAND AND WALES,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6E.
W78-11452

FEEDLOT PAYS PENALTY.
Feedlot Management, V. 18, No 9, p 10, 16, Sept., 1976.

Descriptors: *Water pollution control, Regulation, *Feedlots, Iowa, Pollution abatement.

Two complaints that an Iowa feedlot owner was discharging pollutants without a permit and that he was violating an administrative order to file for a discharge permit resulted in a $5,000 fine, the largest civil penalty ruled against a feedlot owner since the initiation of the Environmental Protection Agency regulations controlling the pollution of public waterways. The penalty came from a set-

tlement which pre-empted a civil trial. In addition to the $5,000 penalty, the Iowa feeder is still required to take steps to prevent discharge of pollutants from his feedlot into nearby Ashton Creek. (Merryman-East Central)
W78-11453

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE. SPECIAL REPORT II: A NON-LINEAR PROGRAMMING MODEL FOR EVALUATING WATER SUPPLY POLICIES IN THE TEXAS COASTAL ZONE,
Texas Univ. at Austin. Div. of Natural Resources and Environment.
J. F. Malina, J. S. Sherman, and R. A. Rios.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 181, Price codes: A06 in paper copy, A01 in microfiche. Prepared for Research Applied to National Needs Program, National Science Foundation, (1976). 107 p, 48 ref. RANN GI-44363; IAC (74-75)-1001.

Descriptors: *Water supply, *Water conservation, *Water reuse, *Evaluation, *Waste water disposal, *Methodology, Water costs, Water rates, Water shortage, Water users, Water values, Pollution taxes(Charges), Texas, Models, *Zero discharge, *Non-linear program, *Coastal zone management, Corpus Christi(TX).

The Corpus Christi, Texas water supply situation may potentially constrain development. Given a reasonable economic growth rate, available municipal and industrial supplies could be exhausted in the foreseeable future. A non-linear programming model was developed and applied to determine the amount of fresh water required to satisfy future demands and to evaluate the effects of alternate methods for reducing demand on the primary source. The effects of three policies designed to reduce water demand were evaluated. These policies increased the cost of both fresh water and effluent disposal for various combinations of users under the specified conditions. A uniform increase in the cost of water for all users resulted in maximum recycle and reuse of effluents, effecting Zero Discharge of Wastewater. This uniform increase also caused the highest increase in total system cost of the three policies. Both increasing the cost for only the industrial sector and application of effluent taxes were tested. Both policies resulted in zero discharge of industrial wastewater and both failed to induce zero discharge for the system as a whole. The former policy provides no economic incentive for municipal wastewater reuse and the latter policy results in a smaller municipal demand reduction than the first two policies. (Nessa-NC)
W78-11454

NONPOINT SOURCE POLLUTION FROM AGRICULTURAL RUNOFF,
Cornell Univ., Ithaca, NY. Dept. of Civil and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-11460

ECONOMIC IMPACT OF FISH TOXICANT REGULATIONS,
Northern Illinois Univ., De Kalb. Loredo Taft Field Campus.
For primary bibliographic entry see Field 6B.
W78-11484

FIRM BEHAVIOR UNDER IMPERFECTLY ENFORCEABLE POLLUTION STANDARDS AND TAXES,
State Univ. of New York at Albany. Dept. of Economics.
J. D. Harford.
Journal of Environmental Economics and Management, Vol. 5, No. 1, p 26-43, March 1978. 2 fig, 15 ref.

Descriptors: *Standards, *Pollution taxes(Charges), *Industrial wastes, *Economics, *Enforcement, *Model studies, Regulation, Governments, Industrial production, Administration, Externalities, Water pollution standards, Air pollution, Marginal cost.

The behavior of a profit-maximizing firm operating under imperfectly enforced pollution standards and pollution taxes is examined using theoretical models. Increasing the expected level of penalty associated with a standard will reduce waste release by the firm, but increasing strictness of the standard only reduces the firm's wastes if the slope of the expected fine function with respect to the size of the standards violation is increasing. Cost subsidies for pollution control expenses are useful for reducing violation of the standard and therefore the level of wastes. Under imperfectly enforceable pollution taxes the firm's marginal costs of pollution reduction are equal to the constant rate of the tax as long as the slope of the expected penalty function is increasing, implying that for a single firm the amount of pollution tax evasion is independent of the actual wastes, which are determined by the pollution tax rate. The tax evasion level is determined by equating the increase in expected penalty with respect to a unit reduction in reported wastes to the decrease in tax paid. Therefore, the general level of fines and the probability of punishment affect reported wastes but no actual wastes. Increasing the tax rate on reported wastes will reduce actual wastes, but will reduce reported wastes even more, with an implied increase in pollution tax evasion. (Lynch-Wisconsin)
W78-11485

POLLUTION CONTROL AND TECHNOLOGICAL ADVANCE: A DYNAMIC MODEL OF THE FIRM,
Duke Univ., Durham. NC. Graduate School of Business Administration.
W. A. Magat.
Journal of Environmental Economics and Management, Vol. 5, No. 1, p 1-25, 1978. 23 ref.

Descriptors: *Model studies, *Water pollution control, *Effluents, *Pollution taxes(Charges), *Technology, *Water quality standards, *Research and development, Standards, Public policy, Governments, Economics, Economic analysis, Industrial production, Labor, Pollution abatement, Regulation, Dynamic models.

Real-world dynamic comparison of effluent taxes and effluent standards, in which firms invest resources in improving both abatement and production technology, shows the two policies lead to distinctly different allocations of research and development funds and that a temporally constant effluent tax leads to an increasing effluent discharge rate for typical firms--contrary to the case of standards. Neither policy stops economic growth, but only reduces the growth rate which results from technological advance. A rising tax rate is necessary to halt growth in the effluent level through use of advancing technology. With difficult labor substitutability: (1) the constant standard induces a direction of technical advance which converges to augmentation of both abatement and production technology, while (2) the constant tax induces ever-increasing allocations to production technology and ever-decreasing allocations to effluent abatement. With easy substitutability: (1) the constant tax induces ever-increasing allocations to effluent abatement, whereas (2) the constant standard leads to a direction of technical advance which diverges toward relatively more output augmentation or toward relatively more effluent abatement, depending on the initial value of the direction. Allocation of effective research and development effort to augmentation of the two technologies appears highly sensitive to both effluent-tax time pattern and the degree of labor substitutability. (Lynch-Wisconsin)
W78-11489

CONTROLLING POLLUTION BY PRICE AND STANDARD SYSTEMS: A CLARIFICATION,
Delaware Univ., Newark. Coll. of Business and Economics.
R. F. Settle, and J. R. Thornton.
Journal of Environmental Management, Vol. 6, No. 1, p 1-7, January 1978. 3 fig, 8 ref.

Descriptors: *Pollution abatement, *Standards, *Pollution taxes(Charges), *Public policy, *Social costs, *Economics, Air pollution, Pollutants, Pricing, Damages, Externalities, Welfare(Economics), Marginal costs, Costs, Taxes.

Conventional arguments for uniform taxes on pollution emissions are evaluated and reconsidered. Baumol and Oates contend in earlier studies that the present inability to measure marginal damages and marginal abatement costs does not preclude using pollutant emission taxes as pollution control instruments. They propose selection of an acceptable concentration level for each pollutant, such as existing U.S. national air quality standards, and then taxation of each pollutant emission at a rate which would attain this acceptable level. As the system employs a uniform tax, with every firm subject to the same tax rate per unit of emission, little detailed information is required. The present authors contend that equalization of marginal abatement costs minimizes the social cost of achieving any pre-selected pollution level. Tietenberg has proposed a zonal tax system as a modification of compensate for regional variations which effect the marginal contribution of a unit of emissions. The present paper shows that not only does the case for a uniform tax depend upon a relation between emissions and pollutant concentration, but also upon a functional relationship between emissions and the damages. The ultimate goal of public policy is to minimize the social cost of achieving an acceptable level of damages, as opposed to concentration or emissions. The analysis provides both theoretical support for the current U.S. policy of varying air quality standards by region, and a theoretical justification of Tietenberg's derived decision rules to be used during the construction of a set of emission taxes. (Lynch-Wisconsin)
W78-11490

ECONOMIC ANALYSIS OF PROPOSED AND INTERIM FINAL GUIDELINES - INTEGRATED IRON AND STEEL INDUSTRY,
Temple, Barker and Sloane, Inc., Wellesley Hills, MA.
H. W. Pifer, III, and D. A. Smith.
Available from National Technical Information Service, Springfield, VA 22161, as PB-273 215, Price codes: A07 in paper copy, A01 in microfiche. Report EPA 230/1-76-048, April 1976. 141 p, 33 fig, 2 tab. 68-01-2832.

Descriptors: *Effluents, *Water pollution control, *Iron and steel industry, *Economic impact, *Water quality standards, *Costs, Economics, Standards, Operating costs, Federal Water Pollution Control Act Amendments of 1972, Model studies, Air pollution, Regulation, Planning, Baseline studies, Forecasting, Analytical techniques, Energy, Employment, Financing, Steel.

The economic impact of environmental regulations on the integrated iron and steel industry was analyzed using cost impact methodology, combined with a computer-based revenue reuirement and external financing methodology. The analysis includes an evaluation of the impact of EPA's recently promulgated phase II effluent guidelines. The foundation of the study is a policy-testing model of the steel industry, PTm(Steel). Capital expenditures to meet Phase II water effluent guidelines are likely to total $2.3 billion for the period 1975-83, of which $1.4 billion will be required to meet EPA's BPCTCA standards and $0.8 billion to meet BATEA standards. Annual operating costs should increase about 0.5% during the next decade, while the increase to the con-

sumer should be less than 1.0%. Steel operations included in this report represent over 70% of net fixed assets of major integrated steel companies during 1972-74. Assumed baseline conditions forecast domextic steel shipments of 120 million tons by 1980. Of $3.6 billion projected for capital expenditures for water pollution control equipment during 1975-83, $2.5 billion will require external financing. Capital expenditures for air pollution equipment are estimated at $3.3 billion (1975-83), with $2.1 billion requiring external financing. Short term financing is considered difficult but feasible. Effects on energy consumption, employment, communities, and balance of trade are assessed. (Lynch-Wisconsin)
W78-11491

EFFLUENT CHARGES: PERSPECTIVES AND COMPARISONS,
Carnegie-Mellon Univ., Pittsburgh, PA. School of Urban and Public Affairs.
O. A. Davis.
In: Water Pollution Control Act of 1972 Study of Effluent Charges, final report to National Commission on Water Quality, June 1976, PB-255 834. 15 p.

Descriptors: *Federal Water Pollution Control Act Amendments of 1972, *Effluents, *Pollution taxes(Charges), *Pollution rights, *Water pollution control, *Economics, Markets, Model studies, Incentives, PL 92-500, Pollution abatement, Alternative planning, Administration, Regulation, Water quality standards, Environmental economics, Economic analysis, Permits.

An evaluation of three companion papers on pros and cons of effluent charges for water pollution control under the Federal Water Pollution Control Act Amendments of 1972 concludes that effluent charges are the most appropriate control mechanism because of administrative flexibility and less-severe data requirements. Allen V. Kneese, Gardner M. Brown, Jr., and Susan Rose-Ackerman agree that market analog devices are superior to other alternatives for water pollution control, but disagree on specifics. Rose-Ackerman most strongly advocates market mechanisms as a control, Brown emphasizes limitations and problems, and Kneese takes an intermediate position. Kneese, a supporter of effluent charges, holds that a governmental authority should be responsible for determining such charges; since private property rights for water have not been established, there is no automatic mechanism for determining supply. On the demand side, however, effluent charges would produce the technology necessary to achieve the desired level of water quality. Rose-Ackerman advocates distribution of pollution rights to the highest bidder as a superior alternative to effluent charges. Once the rights are distributed a market would come into being enabling redistribution of the disposal rights. Brown describes European case histories of effluent charge systems and discusses theoretical aspects. (Lynch-Wisconsin)
W78-11492

THE CASE FOR EFFLUENT CHARGES AS PART OF A NATIONAL ENVIRONMENTAL PROGRAM,
New Mexico Univ., Albuquerque, Dept. of Economics.
A. V. Kneese.
In: Water Pollution Control Act of 1972 Study of Effluent Charges, final report to National Commission on Water Quality, June 1976, PB-255 834. 26 p.

Descriptors: *Federal Water Pollution Control Act Amendments of 1972, *Effluents, *Pollution taxes(Charges), *Water pollution control, *Economics, PL 92-500, Pollution abatement, Economic analysis, Model studies, Markets, Public policy, Alternative planning, Industrial wastes, Municipal wastes, Sewage disposal, Permits, Water quality standards, Regulation, Pricing, Environmental economics, Welfare(Economics), Incentives.

As a policy mechanism for national pollution control, a system of effluent charges would be far superior to a permit system, with exceptions such as for highly toxic wastes. A rationale for modifying present standards strategy in the short run by adding effluent charges is offered: (1) Substantial effluent charges on residuals would help induce the discharges to meet the specified compliance schedule. (2) Since a polluting activity continues to use environmental services as a factor input even after discharge standards are met, a charge for such use constitutes a continuing incentive to consider that input in decision-making, while providing funds for management of the resource. (3) Charges provide a mechanism for moving to higher or lower levels of ambient environmental quality. (4) Effluent charges appear to provide a better stimulus to technological change as they utilize the economic incentives in a market economy. This paper is divided into two sections: (1) a brief discussion of how effluent charges relate to contemporary economic theory on pollution; and (2) an analysis of the relationship between effluent charges and environmental policy. The first section, which discusses the market model, pollution problems in a market system, and pricing the environment, demonstrates that, in principle, prices for residual discharges can be determined which would result in an overall efficiency maximum. (Lynch-Wisconsin)
W78-11493

EFFLUENT CHARGES, A DISCUSSION PAPER,
Washington Univ., Seattle. Dept. of Economics.
G. M. Brown, Jr.
In: Water Pollution Control Act of 1972 Study of Effluent Charges, final report to National Commission on Water Quality, June 1976, PB-255 834. 27 p.

Descriptors: *Federal Water Pollution Control Act Amendments of 1972, *Effluents, *Pollution taxes(Charges), *Water pollution control, *Economics, PL 92-500, Pollution abatement, Economic analysis, Water quality standards, Regulation, Governments, Markets, Netherlands, France, West Germany, Hungary, Model studies, Damage functions, Environmental economics, Welfare(Economics), Permits.

Although an effluent charge system is to be preferred over standards and permits where possible, several untenable arguments have been presented in defense of such charges. In the first section of this paper seven such arguments are discussed, involving theoretical aspects of optimal charges and standards. In section two, following an evaluation of effluent charge systems in the Netherlands, France, West Germany's Ruhr region and Hungary, various aspects of effluent charges are discussed--level, which pollutants to measure, equity, administration, and user charges. Conclusions: (1) In none of the systems do prices reflect opportunity costs, because of the lack of damage function estimates. (2) It is inconclusive whether treating every firm in an industry alike in waste production increases or decreases the incentive to innovate. (3) Even if quantified damage functions were available, lack of data on pollution loads would prevent evaluation of efficiency of a particular effluent charge through use of damage functions with the charge per unit of pollution. (4) The effectiveness of these systems cannot be truly assessed since other policy instruments accompanied the charge systems. (5) Improvements in water quality cannot be directly related to the charge systems due to absence of a referent. Despite these problems of evaluation, it is clear that effluent charges can be levied and administered. Effluent charges must be used primarily as a means of protecting water quality rather than as a source of revenus. (Lynch-Wisconsin)
W78-11494

MARKET MODELS FOR POLLUTION CONTROL: THEIR STRENGTHS AND WEAKNESSES,
Yale Univ., New Haven, CT. Dept. of Economics.
S. Rose-Ackerman.
In: Water Pollution Control Act of 1972 Study of Effluent Charges, final report to National Commission on Water Quality, June 1976, PB-255 834. 34 p, 22 ref.

Descriptors: *Federal Water Pollution Control Act Amendments of 1972, *Effluents, *Pollution taxes(Charges), *Pollution rights, *Water pollution control, *Economics, Markets, Model studies, Incentives, Economies of scale, Regional analysis, PL 92-500, Pollution abatement, Alternative planning, Regulation, Water quality standards, Environmental economics, Economic analysis, Industrial wastes, Municipal wastes, Waste treatment, Permits.

To reduce water pollution as provided for in the Federal Water Pollution Control Act Amendments of 1972, a scheme is proposed under which effluent dischargers would bid for the right to emit wastes. In this way selectively introduced market mechanisms would substantially reduce costs. Pollution rights are considered a better strategy than effluent charges because: (1) they produce quicker results, (2) minimize inequities involved in river basin zonal boundaries, (3) provide a simple means of subsidizing municipalities without sacrificing market efficiency, (4) efficiently permit growth and new entry, and (5) permit rapid resolution of emergencies. Neither pollution rights nor effluent charges will develop an efficient free market in water quality without an active role by government in specifying either quantities or prices, and employing certain more direct regulatory tools. A mixed market-nonmarket approach is recommended. On river systems where joint treatment would be suitable for allocating treatment responsibilities between regional plants and individual waste producers. Where joint treatment would be inefficient, the pollution rights system appears superior to effluent charges. (Lynch-Wisconsin)
W78-11495

POINT SOURCES: NEW ECONOMIC MECHANISMS,
Toronto Univ. (Ontario). Faculty of Law.
D. N. Dewees.
Water Resources Reference Service, p 70-80, 1977. 13 ref.

Descriptors: *Point pollution, *Pollution taxes(Charges), *Regulation, *Pollution abatement, *Standards, *Economics, *Administration, Air pollution, Water pollution control, Effluents, Incentives, Political constraints, Social values, Governments, Legislation, Motivation, Technology, Legal aspects, Public policy, Alternative planning, Cost-benefit analysis, Permits, Monitoring.

Reasons why environmental quality goals are not achieved are analyzed and alternative administrative mechanisms for regulating discharges are evaluated. It is concluded that without the political will for control, no mechanisms will be successful, but if the will exists, an effluent charge will often be more effective than standards. Effluent charges are preferable in cases where emissions or effluents do not signify immediate disaster, but where costs of achieving acceptable environmental quality are high. An effluent charge with or without a free base discount has these advantages: (1) It allows collection of large amounts of money without a large number of lawsuits. (2) Delays and debates are avoided; a charge does not present a clear dividing line between meeting a standard and closing down, and if the charge is thought to be bearable by the firm--or control is impossible--the firm continues to pay. Once the inevitability of the charge is established, the best strategy for the polluter is to install the best and most economical treatment facilities that cost less than the effluent

charge itself, which is precisely the incentive that will maximize technological progress in pollution control. The real choice is not between standards and charges, but between arguing with recalcitrant polluters or imposing large costs on them. The problems of monitoring are also discussed in this paper. (Lynch-Wisconsin)
W78-11501

ENVIRONMENT, INTERNATIONAL TRADE AND WASTE MATERIALS,
Leicester Univ. (England). Public Sector Economics Research Centre.
For primary bibliographic entry see Field 6G.
W78-11503

THE NEEDS FOR WATER QUALITY MODELS ON AGRICULTURAL WATERSHEDS,
Southeast Environmental Research Lab., Athens, GA.
For primary bibliographic entry see Field 5B.
W78-11505

INTERTEMPORAL ENVIRONMENTAL MANAGEMENT WITH A STORABLE POLLUTANT,
Colorado Univ., Boulder. Dept. of Economics.
D. R. Lee.
Journal of Environmental Economics and Management, Vol. 4, No. 2, p 120-128, 1977. 19 ref.

Descriptors: *Pollutants, *Pollution abatement, *Model studies, *Time series analysis, *Pollution taxes(Charges), *Storage, Economics, Decision making, Public policy, Environmental management, Optimization, Marginal costs, Social aspects, Time, Equations, Regulation.

No acceptable model exists of fixed per-unit pollution taxes based on dynamic time-pattern relationships, which will result in socially optimal generation and emission of an environmental pollutant. This suggests deficiencies in the theoretical pattern of fixed per-unit taxes which reflects the optimal marginal social cost of emission at each point in time. As a remedy, a continuous-time model is developed which allows decisions on generation and emission of an environmental pollutant to be separated in time, and the necessary conditions for the socially optimal time pattern of generation and emission are deduced and discussed. The dimension of pollution storage--the ability to separate generation and emission of a pollutant in time--has been ignored in previous dynamic extensions of static models. It is shown that the dynamic analog to the optimal fixed per-unit tax in a static context cannot be expected to motivate the socially optimal solution when pollution can be generated at one point in time and discharged later. This failure is basically the result of: (1) The polluter undervalues the total value of pollution storage capacity when he faces fixed-per-unit pollution taxes; (2) When fixed per-unit taxes are imposed the solution is indeterminate, so that many socially suboptimal solutions are as attractive to the firm as the socially optimal solution. Although this paper does not lend support for a policy of pollution taxes, it does not necessarily establish a sound foundation for critizing such a policy. (Lynch-Wisconsin)
W78-11506

ENFORCEMENT COSTS AND THE INCENTIVE TO EVADE CONTROLS ON PRODUCTION,
South Carolina Univ., Aiken. Dept. of Economics.
R. P. Terrebonne.
Journal of Environmental Economics and Management, Vol. 4, No. 2, p 129-134, 1977. 1 fig, 8 ref.

Descriptors: *Economics, *Enforcement, *Pollution taxes(Charges), *Quotas, *Pollution charges, *Evasion, Regulation, Standards, Externalities, Costs, Model studies, Equilibrium, Marginal costs.

Comparison of enforcement costs of different pollution control schemes using the approach of Buchanan and Tulloch (1975) indicates that exchangeable output quotas may involve fewer incentives to evade regulations than a per-unit tax. This conclusion, which differs from those of Buchanan and Tulloch, contradicts the widespread assumption that emission taxes would be easier to enforce than other policies. A two-step approach to externality control designed originally by Baumol is followed: (1) determine the Pareto optimal level of output, and (2) design policies to achieve that desired level of output. The comparative static model of a perfectly competitive industry assumes the industry is composed of a large number of identical firms. Each firm produces a quantity at which marginal cost is equal to price, and long-run equilibrium is achieved when average cost is also equal to price. Buchanan and Tulloch's analysis is extended by comparing three tax and quota schemes for regulating industry output. When tax evasion is permitted in the model, under each scheme identical incentives for each firm to evade regulations are generated once the number of firms reaches a new long-run equilibrium. However, incentives for evasion with exchangeable quotas before long-run equilibrium is reached depend on initial quota distribution and the way the market adjusts to equilibrium. A quota scheme can be designed in which short-run incentives to cheat are lower than with taxation. (Lynch-Wisconsin)
W78-11511

MANAGING FARMLAND TO IMPROVE WATER QUALITY,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Information.
J. Morrison.
Journal of Soil and Water Conservation, Vol. 32, No. 5, p 205-208, September-October 1977. 1 fig.

Descriptors: *Water quality control, *Black Creek Watershed Study(IN), *Soil erosion, *Cultivation, *Farm management, *Model studies, Indiana, Maumee River Basin(IN), River basins, Watersheds(Basins), Demonstration watersheds, Storms, Sedimentation, Slopes, Land use, Lake Erie, ANSWERS, Nonpoint pollution, Soil types, Nutrients, Soil conservation, Cost-sharing, Incentives.

The Black Creek Watershed Study, in progress since October 1977 in Indiana's Maumee River Basin, has focused on two basic issues: (1) the relationship between erosion in the Black Creek watershed and water quality in Black Creek, the Maumee River, and Lake Erie; and (2) the question of whether a program based on voluntary participation by landowners and cost-sharing incentives have much impact on erosion and water quality. Preliminary results indicats: (1) the relationship between erosion and water, quality, though complex, can be used as a factor in water quality management planning; and (2) voluntary compliance and cost-sharing are well-received, but it is doubtful they can be completely relied upon to meet water quality standards. the project is funded by a $2.4 million EPA grant to the Allen County Conservation District, with subcontracts to Purdue and Illinois Universities and the Soil Conservation Service. Research results, strongly geared to local soil types, slopes, and land use, are extended to eventual impact on teh Great Lakes through application of a detailed erosion and sedimentation model (ANSWERS) developed to simulate storm impact on water quality. A distributed parameter rather than statistical model, it quantitatively describes pollutant sources at all points in the watershed instead of gross erosion at the outlet. Data from small watersheds can be used to develop fundamental relationships, later integrated to describe much larger areas. The model is currently limited to effects of tillage changes, but future applications are discussed. (Lynch-Wisconsin)
W78-11523

WINTER APPLIED MANURE: EFFECTS OF ANNUAL RUNOFF, EROSION, AND NUTRIENT MOVEMENT,
Agricultural Research Service, Morris, MN.
R. A. Young, and R. F. Holt.
Journal of Soil and Water Conservation, Vol. 32, No. 5, p 219-222, September-October 1977. 1 fig, 4 tab, 9 ref.

Descriptors: *Agricultural runoff, *Crop production, *Manure, *Fertilization, *Winter, *Soil erosion, *Water pollution sources, Snowmelt, Precipitation(Atmospheric), Minnesota, Corn(Field), Nutrients, Water pollution control, Agriculture, Cultivation, Rainfall.

Winter-applied manure reduced runoff, soil loss, and nutrient losses from plowed ground in this three-year study, not only during snowmelt as in most other research, but throughout the year. Four test plots in Minnesota were treated as follows: (1) manure applied in early winter on frozen ground; (2) manure applied in late winter on top of snow; (3) manure applied in late fall and plowed under; and (4) no manure applied. Corn wasj planted on all plots after a starter fertilizer (13-36-13) was spread at 224 kg/ha in the spring. Cultivation direction was up- and-down slope. Precipitation ranged from 52-68 cm annually, with snow accounting for 11-18%. Wintermanured corn plots averaged 42% as much runoff and 60% as much soil loss annually as unmanured corn plots; results were consistent during the study period. Nutrient losses from manured plots were lower each year than from unmanured plots. Soil loss on manured plots averaged 10.9 metric tons/ha annually, compared with an average annual loss of 20.5 metric tons/ha from the unmanured check plot and 16.5 metric tons/ ha for natural rainfall runoff plots (10 year averages). Rainfall erosion rather than snowmelt erosion accounted for 99% of these soil losses. Average runoff was 3.8 cm on the two surface-applied manured plots, 4.0 on the plowed manured plot, 8.6 cm on the natural rainfall runoff plots, and 10.1 cm on the check plot. (Lynch-Wisconsin).
W78-11524

FACTORS AFFECTING NUTRIENT LOADS IN SOME IOWA STREAMS,
Iowa State Univ., Ames. Dept. of Animal Ecology.
For primary bibliographic entry see Field 5B.
W78-11525

EFFICACY OF COPPER SULPHATE IN THE SUPRESSION OF APHANIZOMENON FLOS-AQUE BLOOMS IN PRAIRIE LAKES,
Fisheries and Marine, Winnipeg (Manitoba). Freshwater Inst.
J. Whitaker, J. Barica, H. Kling, and M. Buckley.
Environmental Pollution, Vol. 15, No. 3, p 185-194, 1978. 4 fig, 2 tab, 12 ref.

Descriptors: *Copper sulfate, *Aphanizomenon flos-aquae, *Algal control, *Algicides, *Eutrophication, *Rates of application, Lakes, Manitoba(Canada), Canada, Prairie lakes, Algae, Phytoplankton, Fish farming, Fishkill, Summerkill, Chemcontrol, Pesticide residues, Cyanophyta, Chlorophyll, Pothole lakes.

Experiments show that copper sulfate application levels recommended by Canadian agricultural authorities for suppression of blooms of the blue-green filamentous alga Aphanizomenon flos-aquae are about five times higher than necessary. A single application not higher than 40 micrograms Cu/1 applied before filaments exceed 10 mm is suggested for bloom suppression. The 250 micrograms Cu/1 recommended by authorities is enough to kill rainbow trout in fish-farming lakes. In these tests copper sulfate was added to five shallow eutrophic prairie lakes in the Rickson-Elphinstone area of

Manitoba at 25-360 micrograms Cu/l, and at 100-3000 micrograms Cu/l in experimental tubes in one lake. Tests were conducted in early July in 1973-75. Blooms of A. flos-aquae are a major cause of summer mortality of trout stocks in prairie ponds (Potholes); temporary low oxygen levels (summerkill) result from the sudden death and decomposition of the blooms. Excellent algal control was achieved at all treatment concentration. Chlorophyll typically declined from 48-55 micrograms/l to 2-4 micrograms/l after four days, with complete elimination of A. flos-aquae. The alga generally reappeared later, but never at levels to cause summerkill. Copper concentrations returned to background levels in 8-10 days. (Lynch-Wisconsin)
W78-11527

A SUMMARY OF THE BIOGEOCHEMISTRY OF NITROGEN COMPOUNDS IN GROUND WATER,
California State Univ., Chico.
For primary bibliographic entry see Field 5B.
W78-11535

WATER POLLUTION FROM NONPOINT SOURCES,
Midwest Research Inst., Kansas City.
For primary bibliographic entry see Field 5B.
W78-11543

SIX POLLUTED LAKES: A PRELIMINARY EVALUATION OF THE TREATMENT AND RECOVERY PROCESSES,
Uppsala Univ. (Sweden). Algal Assay Lab.
S. O. Ryding, and C. Forsberg.
Ambio, Vol. 5, No. 4, p 151-156, 1976. 1 tab., 5 fig., 30 ref.

Descriptors: *Pollution abatement, *Sewage treatment, *Lakes, *Reclaimed water, *Eutrophication, *Seasonal, *Chlorophyll, *Diversion, Sampling, On-site investigations, Water pollution sources, Water pollution control, Nutrients, Water quality control, Water quality, Nitrogen, Phosphorus, Domestic wastes, *Lake Ekoln(Sweden), *Lake Sillen(Sweden).

Recovery processes of six polluted lakes were studied after reduction of nutrients. The decrease in phosphorus input due to advanced sewage treatment varied between 30-80 percent of the prediversion data. Two lakes showed improved water quality, while in two others no marked changes were observed. Two lakes showed lower transparency and higher chlorophyll values after diversion. In small, shallow and heavily polluted lakes, the annual internal phosphorus loading from the sediments varied between 20 percent and 400 percent of the external input. Restoration of lakes by removing nutrients via removal of algae is discussed. (EIS-Katz)
W78-11549

CONTROL RUNOFF FROM OPEN LIVESTOCK FEEDLOTS.
Crops and Soils Magazine, V. 30, No. 2, p 22-23, Nov. 1977. 1 fig.

Descriptors: *Agricultural runoff, *Feedlots, *Water pollution control, *Runoff control, Zero-discharge, Vegetative filters.

University of Illinois researchers are studying zero-discharge and vegetative filter systems to handle potential feedlot runoff. The zero-discharge system required cleaning solids from the settling basin and removing water from the holding ponds when necessary. A recent study indicates that potential benefits from a holding pond include nutrient value and a possible source of irrigation water. Because of seasonal nitrogen and phosphorus variation in the holding pond water, emptying ponds in the spring will provide maximum fertilizer benefits. However, ponds should also be emptied in the fall to provide capacity for winter runoff. Vegetative filter areas may prove a less costly runoff control system that requires less management. Pastures, grassed waterways, or cropland could be vegetative filter areas although current systems being studied have been constructed for this specific purpose. These are areas where runoff could be treated by settling, filtration, dilution, absorption, and infiltration. The portion of runoff that does not infiltrate into the ground will be treated by moving the vegetative filter and will not pollute surface water beyond the filter. This concept also seems to have potential for reducing sediment and other pollutant contributions to streams from agricultural non-point sources. (Merryman-East Central)
W78-11552

ENVIRONMENTAL PROTECTION REQUIREMENTS FOR SWINE OPERATIONS,
Texas Agricultural Extension Service College Station.
J. M. Sweeten.
Fact Sheet L-1302, Agricultural Extension Service, Texas A&M University, 1975, 4 p, 6 fig.

Descriptors: *Air pollution, Odor, Water pollution, Regulation, *Farm waste, Environmental quality, *Swine, Permit, Texas Water Quality Board, Environmental Protection Agency.

Summarized in this report are the State and Federal water and air pollution control regulations pertaining to swine operations. The Texas Water Quality Board (TWAB) requires a 'Certificate of Registration' for swine feeding operations with more than 50 head of hogs. This certificate stipulates no discharge of wastewater of runoff from the premises. A procedure is presented that will meet the 'no-discharge' standard. The EPA requires a permit for swine procedures of more than 2500 hogs in confinement in which the 'no-discharge' standard also appplies. A joint permit may be obtained to satisfy both state and federal agencies. The Texas Air Control Board requires a construction and operating permit on new production operations with more than 1000 head of hogs. This applies also to any existing operations that are planning to expand 100% or more in feeding capacity. The TACB also regulates odors from existing swine feeding facilities under a general nuisance regulation. The procedure for obtaining permits from the TWQB, TACB, and the EPA are presented as well. (Bates-East Central)
W78-11556

CONTROL OF THE BIOLOGICAL AVAILABILITY OF TRACE METALS TO A CALANOID COPEPOD IN A COASTAL FJORD,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-11572

ALASKA WASTEWATER TREATMENT TECHNOLOGY,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5D.
W78-11575

AN EVALUATION OF THE EFFECT OF DRAWDOWN ON THE TROPHIC STATUS OF A SMALL RESERVOIR,
Georgia Coll., Milledgeville. Center for Environmental Study and Planning.
E. H. Barman, Jr., and D. G. Baarda.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 328, Price codes: A05 in paper copy, A01 in microfiche. Georgia Institute of Technology, Atlanta, Environmental Resources Center, Report ERC-01-78, January 1978. 73 p, 16 fig, 28 tab, 49 ref. OWRT A-062-GA(1), 14-31-0001-5010.

Descriptors: Reservoirs, *Drawdown, *Trophic level, *Lake restoration, *Georgia, *Lake Laurel(Geo), Dissolved oxygen, Biochemical oxygen demand, Turbidity, Sulfides, Nitrogen, Phosphorus, Iron, Phytoplankton, Biomass, Productivity, Periphyton, Eutrophication, Lake sediments, Benthic fauna, Water pollution control, Algae.

An evaluation of physical lake drawdown as a method of restoring small, eutrophic lakes and reservoirs was undertaken. Lake Laurel, a 5.4 ha reservoir in central Georgia, was drained and the sediments exposed to drying and erosion for six months. Before drawdown, determinations of dissolved oxygen, biochemical oxygen, biochemical oxygen demand, turbidity, sulfide, nitrogen, phosphorus, and iron were undertaken. Biological parameters considered were distribution and relative abundance of benthic macro-invertebrates, phytoplankton biomass, and periphyton productivity. A post-drawdown evaluation of the same parametes was undertaken during corresponding time periods. Preliminary observations indicated that Lake Laurel was eutrophic, but data obtained during both phases of the study indicate that the system is mesoeutrophic, or at most, ildly eutrophic. However, a comparison of pre- and drawdown data revealed changes in several of the categories investigated. Total phosphorus, total soluble phosporus, and ortho-phosphorus concentrations were significantly lower after drawdown. Significant reductions in phytoplankton biomass and periphyton production were observed during the summer of 1976 after drawdown. In 1977, phytoplankton biomass and periphyton production rates were near those observed before the lake was drained. Concentrations of total, soluble, and ferrous iron were also monitored. Low iron concentrations near the surface were unaffected by the manipulation; however, high levels observed near the sediments increased after drawdown. Additional experiments provided indications that there were increases in organic compounds near the sediments and decreases in the amounts of oxalate extractable iron in the sediments. No changes were observed in the other parameters. Concentrations of dissolved oxygen near the sediment interface were zero during most of the pre-drawdown phase, and these conditions persisted after drawdown. Low oxygen resulted from sediment oxygen demand rather than from conditions associated with the trophic status of the system.
W78-11576

RESEARCH NEEDS RELATING TO WATER/LAND PROBLEMS IN URBANIZING AREAS.
Illinois Univ. at Urbana-Champaign. Water Resources Center.
For primary bibliographic entry see Field 6B.
W78-11578

THE EFFECTIVENESS OF CAPITAL INVESTMENTS IN THE PROTECTION OF THE NATURAL ENVIRONMENT,
M. Loiter.
Problems of Economics, Vol 20, No 4, August 1977, p 69-91. 4 ref. (Translated from Voprosy Ekonomiki, 1976, No 1).

Descriptors: *Soviet Union, *Resources development, *Pollution abatement, *Planning, *Natural resources, *Investment, Environmental effects, Social aspects, Economic development, Communism, Capitalism, Political aspects, Forecasting, Recycling, Erosion control, Capital, Five-year plans, Soil erosion, Land reclamation, Flood control.

By contrast with the ecological crisis being created in several industrialized capitalist countries because of the spontaneous exploitation of natural resources based on the private ownership of the means of production, the socialist system excludes antagonism between the goals of social production

and the demands of ecology, which are both directed toward preserving and improving the environment. Western scientists forecasting the inevitability of ecological catastrophe as a result of the progress of civilization in reality reflect capitalist society, whose spontaneous development brings man into conflict with nature. The draft of the tenth Five-Year Plan (1976-80) of the Central Committee of the Communist Party of the Soviet Union for the Twenty-Fifth Party Congress specifies the necessity of elaborating and implementing measures for the production of the environment, and for the rational use and reproduction of natural resources. Development of new technological processes to reduce and recycle waste materials is envisaged. Proposals include improvement of soil fertility; protection of soil against erosion, secondary salinzation, dehydration, flooding, and waste contamination; and mining land reclamation. Details of the plan are described. To measure capital investment effectiveness, it is possible to use a valuation of natural resources based on the same principles as for determining the magnitude of capital investment, current expenditures, and effects. (Lynch-Wisconsin)
W78-11580

DETERGENT PHOSPHATE BAN.
Environmental Protection Agency, Chicago, IL. Phosphorus Committee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 903, Price codes: A04 in paper copy, A01 in microfiche. Report No EPA-905/2-77-003, June 1977. 62 p, 9 fig, 19 tab, 9 ref. 2BA644.

Descriptors: *International Joint Commission, *Phosphates, *Detergents, *Water pollution control, *Eutrophication, *Nutrient removal, *Phosphorus, *Regulation, Nutrients, US Environmental Protection Agency, Great Lakes, Watersheds(Basins), Sewage treatment, Effluents, Domestic wastes, Industrial wastes, Fallout, Tributaries, Lakes, International commissions.

On advice of the International Joint Commission (IJC), the U.S. Environmental Protection Agency is now recommending adoption of detergent phosphorus bans in all Great Lakes basin states. This report reviews: (1) the background of phosphorus control policy, (2) advantages and disadvantages of a ban, and (3) its feasibility. In 1971, when phosphorus was recognized as the limiting nutrient for algal growth in all of the Great Lakes and most inland lakes of the region, the United States adopted a policy of relying on chemical treatment to reduce phosphorus levels in municipal sewage and industrial wastes discharged into waterways. Because this policy failed to decrease and stabilize eutrophication rates, means of reducing phosphorus loadings have been reconsidered. Under the 1972 agreement between the U.S. and Canada, a one mg/liter limit for municipal treatment plant effluents was set. Several factors have modified earlier conclusions on phosphorus loadings, including the fact that significant inputs derive from the atmosphere, tributary loadings were underestimated, and the one mg/liter achieved less than hoped for. An IJC report has urged immediate adoption of a uniform 0.5% phosphorus limit by weight for all detergents, and suggested a 0.1 mg/l effluent limit may be necessary. Data on phosphorus loadings in each of the five Great Lakes are included in this report. (Lynch-Wisconsin)
W78-11581

ENVIRONMENTAL IMPACTS OF MECHANICAL HARVESTING OF SUBMERSED VASCULAR PLANTS,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
S. R. Carpenter, and M. S. Adams.
IES Report 77, June 1977. 30 p, 1 fig, 3 tab, 106 ref. GI-39193 and BMS-75-19777.

Descriptors: *Harvesting, *Submerged plants, *Mechanical control, *Aquatic weed control, *Environmental effect, *Eutrophication, *Lake Wingra(WI), Wisconsin, Trophic level, Phytoplankton, Algae, Filamentous algae, Lakes, Macrophytes, Nutrients, Chemcontrol, Herbicides, Ecosystems, Limnology, Reviews.

Potential environental effects of macrophyte harvesting are classified and assessed, relevant literature is reviewed, and further researsch needs are indicated. Potential limnological effects include changes in :(1) the physical and chemical environment, (2) the structure of autotroph and heterotrop communities, and (3) functional aspects of the lake ecosystem (such as nutrient cycling and metabolism). Harvesting offers numerous advantages over herbicides in that: (1) it is relatively target-specific, (2) it removes the nuisance immediately, (3) deleterious side effects of toxins are avoided, (4) physical removal also removes the nutrient content of the plants from the lake, and (5) harvested material is potentially useful as mulch, fertilizer, or fodder. Harvesting offers a unique experimental opportunity to study limnological effects of the large-scale, selective removal of an ecosystem component. Data from Lake Wingra in Madison, Wisconsin, Indicate that harvesting can slow eutrophiation by decreasing accumulation rates of mineral nutrients and organic matter. A survey of the literature, however, indicates very little information on long-term effects of harvesting. In some cases filamentous algae may dominate littoral areas following harvesting. Harvesting would also free new habitat for invasion by phytoplankton, at least temporarily, but macrophyte regrowth would probably partially displace the phytoplankton. (Lynch-Wisconsin).
W78-11586

PROCEEDINGS, RESEARCH PLANNING CONFERENCE ON THE AQUATIC PLANT CONTROL PROGRAM, 19-22 OCTOBER 1976, ATLANTIC BEACH, FLORIDA.
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A044 590, Price codes: A14 in paper copy, A01 in microfiche. Miscellaneous Paper A-77-3, August 1977. 301 p, 136 fig, 60 tab, 108 ref, 2 append.

Descriptors: *Aquatic Plant Control Program, *Aquatic weed control, *Army Corps of Engineers, *Water hyacinth, *Hydrilla verticillata, *Biocontrol, *Chemcontrol, *Eutrophication, *Water pollution effects, Mechanical control, Integrated control, Eichhornia crassipes, Florida, Louisiana, South Carolina, Texas, Herbicides, Lake Conway(FL), Macrophytes, Controlled-release herbicides, Lakes, Reservoirs, Methodology, Data processing, Ecology, White amur, Ctenopharyngodon idella.

The eleventh annual meeting on the Aquatic Plant Control Research Program of the U.S. Army Corps of Engineers was held in Atlantic Beach, Florida October 19-22, 1976. Thirty-six papers are published in these proceedings. Introductory papers deal with goals of the program and an overview of research projects. Fourteen papers present district and local control program status reports. The remaining papers cover such topics as current EPA aquatic herbicide regulations; data processing; evapotranspiration; the Lake Conway (Florida) white amur biological control project; herbicide efficacy and uptake by fish; controlled-release herbicides; biological control with insects, pathogenic fungi, and fish; integrated biological-chemical-mechanical control; remote sensing and data handling. While current control methods have not resulted in satisfactory aquatic plant control, several alternative measures have yielded promising results in preliminary experiments, such as controlled-release herbicides and integration of several control agents. Studies of mechanical harvesting methods and the herbivorous fish, white amur, are continuing. Priorities of the Aquatic Plant Control Program are: (1) technology transfer, (2) research, (3) cost-sharing, and (4) planning. In 1975 research emphasis was shifted more toward meeting operational needs of field staff, especially techniques for proper use of plant-control agents. (See W78-11592 thru W78-11622) (Lynch-Wisconsin)
W78-11591

OVERVIEW OF THE U.S. ARMY CORPS OF ENGINEERS AQUATIC PLANT CONTROL RESEARCH PROGRAM,
Army Engineers Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 4A.
W78-11592

CURRENT STATUS OF THE AQUATIC PLANT CONTROL PROGRAM IN TEXAS,
Army Engineer District, Galveston, TX.
C. O. Martin, and W. T. Nailon.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 19-23, 1 tab, 5 ref.

Descriptors: *Texas, *Aquatic weed control, *Water hyacinth, *Alligatorweed, *Herbicides, *Biocontrol, *Aquatic Plant Control Program, 2,4-D, Alligatorweed flea beetle, Agasicles hygrophila, Eichhornia crassipes, Alternanthera philoxeroides, Rates of application, Chemcontrol, Water pollution effects, Nutrients, Eutrophication.

The Aquatic Plant Control Program in Texas, a shared-cost arrangement between the federal government and Texas, is at present primarily directed at eradication or control of water hyacinth (Eichhornia crassipes) and alligatorweed (Alternanthera philoxeroides). Water hyacinth are treated with 2,4-D formulations applied at a maximum rate of four lbs in 100 gal water per surface acre, with spreader stickler additives to ensure adhesion to plants. Infestations are under manageable control except in parts of the north coastal work area; 28,933 acres of hyacinths have been eliminated in eight watersheds since 1970. Alligatorweed infestations have increased greatly on much of the Texas coast in recent years as a result of increased nutrient levels in basins and creation of new reservoirs. Control efforts, dependent to date on the alligatorweed flea beetle (Agasicles hygrophila), have been only partially successful due to erratic weather -- delayed winters, frequent rain, and cool spells during peak beetle growth periods. Future control efforts will integrate herbicidal treatment with continued introduction of flea beetles; herbicides will consist of the same 2,4-D formulations and rates as for water hyacinth. Current operational activities of the plant control program are concentrated in the lower portions of 10 of the 18 work areas; a table of infestations is given. The most critical areas are the Trinity and Sabine river basins, and the north coastal area. (See also W78-11591) (Lynch-Wisconsin)
W78-11593

STATUS OF RECONNAISSANCE SURVEY REPORT AND REVIEW OF AQUATIC PLANT PROBLEMS IN THE STATE OF OKLAHOMA,
Army Engineers District, Tulsa, OK.
L. M. Mason.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 24-26, 1 fig, 1 tab.

Descriptors: *Oklahoma, *Aquatic weeds, *Robert S. Kerr Lake(OK), *Eurasian water milfoil, *Aquatic Plant Control Program, Myriophyllum spicatum, Aquatic weed control, Lakes, Reservoirs, Eutrophication, Water pollution effects, U.S. Army Engineer Southwestern Division.

A 1975 reconnaissance survey report of aquatic plant infestations in lakes and navigable waterways of Oklahoma is being revised, and is expected to be resubmitted for approval by the Southwestern Division Office by May 1, 1977. The present paper also deals with infestation of Eurasian water milfoil (Myriophyllum spicatum), Oklahoma's most serious aquatic plant problem, in Robert S. Kerr Lake. M. spicatum is also present in other lakes and streams--in 1975 an estimated 8206 acres in 12 major impoundments were infested. A table enumerates acres of infestation for each lake, which are also shown on a map. In Robert S. Kerr Lake water milfoil growth was first observed in 1971; currently (1976) some 600 acres are infested, compared with 328 acres in 1975. The entire McClellan-Kerr navigation system from Tulsa to New Orleans could be infested in a short time. No control measures have been taken to date in Robert S. Kerr Lake, but methods are under investigation. Although large barge traffic may never be seriously hampered, other commercial activities, recreation, and human safety are threatened. (See also W78-11591) (Lynch-Wisconsin)
W78-11594

EAST TEXAS RESERVOIRS--AQUATIC PLANT CONTROL,
Army Engineer District, Fort Worth, TX.
E. J. Moyer.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 27-32.

Descriptors: *Texas, *Reservoirs, *Aquatic weed control, *Water hyacinth, *Alligatorweed, *Aquatic Plant Control Program, Lakes, B.A. Steinhagen Lake(TX), Sam Rayburn Reservoir(TX), Eichhornia crassipes, Alternanthera philoxeroides, Alligatorweed flea beetle, Agasicles hygrophila, 2,4-D, Herbicides, Water pollution effects, Eutrophication.

Aquatic weed problems and control measures in Texas' Fort Worth District of the Federal Aquatic Plant Control Program is reviewed. Of 17 reservoirs in the area (75% on the Trinity and Brazos River Systems), only two have weed problems serious enough to require an annual control program: Town Bluff Dam-B.A. Steinhagen Lake, and Sam Rayburn Dam and Reservoir, both located in east-central Texas. The area is characterized by erosion-prone sandy loam soils and pine forests; to the north are marsh areas. The most serious plant problems are water hyacinth (Eichhornia crassipes) and alligatorweed (Alternanthera philoxeroides). Both are problems at Steinhagen Lake, while at Sam Rayburn Reservoir water hyacinth are the primary problem. The amine formulation of 2,4-D applied at 2-4 lbs of acid equivalent/acre has been used in both lakes. Treatment in Steinhagen Lake, begun in 1963, has resulted in 85-90% control, although the original 200 acres of water hyacinth have grown to 1000-1500 acres, and there are 600 acres of alligatorweed. In Sam Rayburn Reservoir treatment was begun in 1965, but the second program was not started until 1971. There were 500 acres of water hyacinth in 1965, now increased to 2000 acres. In 1975 a cost-sharing arrangement was initiated with the federal government, and the required conversion from helicopter to boat application of herbicides did not lower effectiveness. (See also W78-11591) (Lynch-Wisconsin)
W78-11595

AQUATIC PLANT CONTROL PROGRAM IN THE ST. PAUL DISTRICT,
Army Engineer District, St. Paul, MN.
D. E. Wadleigh.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 33-34.

Descriptors: *Minnesota, *North Dakota, *Wisconsin, *Aquatic weed control, *Cyanophyta, *U.S. Army Engineer North Central Division, *Army Engineer, St. Paul District, *Aquatic Plant Control Program, Lakes, Reservoirs, Potamogeton, Vallisneria, Eutrophication, Ceratophyllum, Aphanizomenon, Algae, Herbicides, Mechanical control, Biocontrol, Enzymes, Water pollution effects.

Attempts to institute the Federal Aquatic Plant Control Program in the North Central Division of the U.S. Army Engineers were unsuccessful until recently due to lack of local interest. In the St. Paul District, which has the most active control program in the division, the most common problems concern recreational lakes and reservoirs becoming eutrophic or overgrown with rooted aquatics. Major problems are blue-green algae (Aphanizomenon) and submerged rooted plants (Potamogeton, Vallisneria, and Ceratophyllum). Because public opinion strongly opposes herbicides, most proposed solutions are mechanical or biological. Recent research at the Freshwater Biological Research Institute of the University of Minnesota showed the existence of an enzyme unique to cyanophyte and bacterial reproductions; it is hoped that manipulation of this enzyme can be used to slow or regulate the cyanophyte growth rate and reproductive cycle. The most significant advances made by the St. Paul District have been in establishing cooperative administration of the programs in North Dakota and Wisconsin. Of about 200 North Dakota lakes with significant actual or potential recreational use, about 30 have weed or eutrophication problems. A 'Plan of Approach' is being prepared in cooperation with the North Dakota Game and Fish Department. In Wisconsin, 'Plan of Approach' is also in preparation, in cooperation with the Wisconsin Department of Natural Resources. (See also W78-11591) (Lynch-Wisconsin)
W78-11596

AQUATIC PLANT CONTROL ACTIVITIES--OHIO RIVER DIVISION,
Army Engineer district, Nashville, TN.
C. W. Crews.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 35-37, 1 fig.

Descriptors: *Tennessee, *Kentucky, Army Engineer Ohio River Division, *Aquatic weed control, *Tennessee River, *Cumberland River, *Army Engineer Nashville District, *Aquatic Plant Control Program, Water lilies, Nymphaea odorata, 2,4-D, Herbicides, Rivers, Watersheds(Basins), River basins, Tennessee Valley Authority, Eutrophication, Water pollution effects.

Of four districts in the Ohio River Division of the U.S. Army Engineers, only the Nashville(Tennessee) District has been required to take part in the Aquatic Plant Control Program. The Huntington district (West Virginia) has experienced a minor problem with plant growth on wastewater treatment lagoons, but the Louisville (Ohio) and Pittsburgh (Pennsylvania) districts have been free of such problems. The Nashville District is formed by the basins of the Tennessee and Cumberland rivers. The Army Corps of Engineers is charged with the full water resource development of the Cumberland River Basin, while the Tennessee Valley Authority has primary responsibility for overall development and operations in the Tennessee River Valley. There have been no major problems with aquatic macrophytes in the Cumberland River basin of the Nashville District, and the only significant aquatic plant control consisted of application of 2,4-D to 150 acres of water lilies (Nymphaea odorata). The program was discontinued after 10 years in 1968 when infestation was stabilized and controlled. There are small but stabilized infestations of water milfoil, alligatorweed, willowweed, and cattail in numerous areas in the basin, and recently there was a slight increase in a few infested areas on one upstream storage project. Reservoir control operations and terrain probably account for the lack of problems in the Cumberland Basin compared with the Tennessee Valley. (See also W78-11590) (Lynch-Wisconsin)
W78-11597

AQUATIC PLANT PROBLEMS, LAKE SEMINOLE, U.S. ARMY CORPS OF ENGINEERS,
Army Engineer District, Mobile, AL.
A. K. Gholson, Jr.
In: Miscellaneous Paper A-77-3 August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 42-44.

Descriptors: *Aquatic weed control, *Lake Seminole(FL GA), *Water hyacinth, *Biocontrol, *Eurasian water milfoil, *Alligatorweed, *Aquatic Plant Control Program, Florida, Georgia, Lakes, Impoundments, Eichhornia crassipes, Alternanthera philoxeroides, Myriophyllum spicatum, Giant cutgrass, Hydrilla, Eelgrass, Mechanical control, Chemcontrol, Herbicides, Public health, Alligatorweed flea beetle, Agasicles hygrophila, Recreation, Hydroelectric power, Eutrophication, Water pollution effects.

Severe infestation by numerous species of submersed aquatic plants jeopardizes continued use of Lake Seminole in Florida and Georgia. About one-third of the 40,000-acre impoundment is infested, and both navigation and hydroelectric power generation (for which the project was created in 1955-57) are threatened. Small boat navigation and other recreational activities almost cease in infested areas bewteen May-November. The biological balance of the lake has been upset, including fish predato-prey relationships. Nuisance plants also pose a public health hazard, as they provide ideal habitats for organisms that transmit serious communicable diseases. The plants threaten to infest downstream areas as well, including rich oyster-producing areas of Apalachiocola Bay. A comprehensive plant control program is urgently needed, though elimination of vegetation is neither possible nor desirable. Mechanical (such as water-level manipulation), biological, chemical, and legal control measures are planned. In October 1976 acreage of various plants was estimated: Eurasian water milfoil (Myriophyllum spicatum), 8000; giant cutgrass, 4500; hydrilla, 1000; water hyacinth (Eichhornia crassipes), 800; and alligatorweed (Alternanthera philoxeroides), 50. Chemical control of hyacinth 1958-59 led to phenomenal growth of alligatorweed in the early 1960s, but the latter was successfully controlled by use of the alligatorweed flea beetle, Agasicles hygrophila. (See also W78-11591) (Lynch-Wisconsin)
W78-11599

SELECTIVE MAINTENANCE CONTROL PLAN, ST. JOHNS RIVER, FLORIDA,
Army Engineer District, Jacksonville, FL.
J. C. Joyce.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 45-48, 1 fig.

Descriptors: *Aquatic plant control program, *St. Johns River(FL), *Aquatic weed control, *Water hyacinth, *Methodology, *Analytical techniques, *Water management, *Planning, *Army Engineer Jacksonville District, 2-4-D, Herbicides, Chemcontrol, Biocontrol, Neochetina eichlorniae, Mechanical control, Eichhornia crassipes, Selectivity, Maintenance, Environmental effects, Social aspects, Florida, Rivers, Water hyacinth weevils, Eutrophication, Water pollution effects.

The process of developing a selective maintenance conrol program for water hyacinth (Eichhornia crassipes) in the St. Johns River, Florida, is described and schematically illustated. The analytical and methodological techniques can be extended to other localities for which a control program is needed. The program developed by the Jacksonville District of the U.S. Army Engineer South Atlantic Division involves selective maintenance spraying with the dimethylamine salt of 2,4-D, and is designed to maintain infestation at the lower level possible while providing for public use of the river and minimizing environmental effects. Major objectives of the program are to: (1) develop a clear operational plan and policy, (2) concentrate on areas of heaviest infestation, (3) reduce total herbicide level, (4) reduce environmental impact, (5) tailor treatment to specific needs of various sections of the river, (6) integrate biological and mechanical methods (including use of the water hyacinth beetle, Neochetina eichhorniae),l and (7) schedule operations to minimize interference with fish and wildlife activities and public access to the river. Planning involved: (1) Analysis of the environmental setting--plant populations; water body morphology; streamflow, water stage, and weather trends; obstructions; natural collection points; habitats; crops; navigation channels; herbicide restrictions; and public opinion. (2) Analysis of resources. (3) Design of preliminary operational plan. (4) Initiation of the operational pln, involving two phases: clean-up, and routine maintenance. (Lynch-Wisconsin) (See also W78-11591).
W78-11600

CONTROL OF WATERCHESTNUT IN NEW YORK STATE,
Army Engineer District, New York.
S. M. Hook.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 55-59, 5 ref.

Descriptors: *Aquatic Plant Control Program, *New York, *Water chestnut, *Aquatic weed control, *2,4-D, *Chemcontrol, Army Engineer New York District, Mechanical control, Trapa natans, Hudson River, Mohawk River(NY), Lake Champlain, Rivers, Lakes, Herbicides, Biocontrol, Eutrophication, Water pollution effects

Measures for control of water chestnut (Trapa natans) in the U.S. Army Engineer New York District emphasize work in the Hudson and Mohawk rivers and portions of Lake Champlain. Introduced into the United States in 1884 at Collins Lake, New York to enhance asethetic and fishery resources, the plant has spread to the Mohawk River by 1920, and to the Hudson River, Lake Champlain, and the Finger Lakes by 1944. Water chestnut virtually closes off bays with impenetrable mats, hinders recreation, displaces desirable wildfowl food plants, reduces near-shore habitat for game fish, provides insect breeding grounds, impedes flow in water supply intakes, and produces a dangerous sharp-spined seed. Large-scale control efforts were begun in 1946, and included: (1) hand pulling, (2) underwater mowing and self-propelled barges, and (3) herbicidal spraying of the isopropyl ester of 2,4-D in fuel oil. After [illegible]erial spraying was replaced by spraying from boats. In 1965 a systematic eradication program was initiated, under combinations of federal and state funds. A steady decline in infestations has resulted, decreasing from 2826 acres in 1966 to 1340 acres in 1976. Total contract spraying costs in 1974 were $31.60/acre, including labor costs of $18.52/acre. Hand pulling costs are about $69.27/acre. An application rate of 8 lbs acid equivalent 2,4-D/acre has proven effective, sprayed directly on leaf surfaces. (See also W78-11591) (Lynch-Wisconsin)
W78-11603

AUTOMATED PROCESSING OF APC FIELD OPERATIONS DATA,
Army Engineer District, Jacksonville, FL.
J. T. McGehee.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 61-74, 11 fig.

Descriptors: *Aquatic Plant Control Program, *Aquatic weed control, *Data processing, *Automation, *Monitoring, *Data storage and retrieval, *Computer programs, Army Engineer Jacksonville District, Florida, Methodology, Data collections, Water hyacinth, Eichhornia crassipes, Eutrophication, Water pollution effects.

A computerized data processing, storage, and retrieval system developed for the U.S. Army Engineer Jacksonville District's Aquatic Plant Contrl Program is described, and examples of weekly report forms and output are illustrated. The plant control program in the district includes 30 field crews reporting data each week. An earlier report form was modified to facilitate keypunching. The new form is organized into four sections: (1) heading, (2) personnel and equipment (rental, wages, other costs), (3) time distribution of the field unit, and (4) general (area treated, conditions, materials used, remarks). Marginal numbers define fields for keypunch operators. A computer program in COBOL was developed to process data and generate a cumulative summary. Programs flag missing or incorrect data; compile and summarize data; separate data by agency, type of field unit, and acreage; display acreage of plants treated by watershed number and cost account number; and write a monthly transaction tape containing all raw data from the cards. Before keypunching, forms are reviewed manually for errors. Provision was made for expansion, as for example multiple-digit watershed code numbers to enable later division into sections, and a numerical code to sallow addition of new plants. At present only water hyacinth are being treated by the district. (See also W78-11591) (Lynch-Wisconsin)
W78-11604

THE PROJECTED IMPACT OF WATER HYACINTH INFESTATION IN TEXAS,
Texas A and M Univ., College Station. Remote Sensing Center.
For primary bibliographic entry see Field 4A.
W78-11605

THE LARGE-SCALE OPERATIONS MANAGEMENT TEST (LSOMT) WITH THE WHITE AMUR AT LAKE CONWAY, ORLANDO, FLORIDA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
R. F. Theriot.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 87-96, 8 fig.

Descriptors: *White amur, *Biocontrol, *Aquatic weed control, *Lake Conway(FL), *Hydrilla verticillata, *Environmental effects, *Aquatic Plant Control Program, Florida, Eurasian water milfoil, Myriophyllum spicatum, Hydrilla verticillata, Ecology, Ecosystems, Lakes, Ctenopharyngodon idella, Fish, Eutrophication, Water pollution effects.

The white amur fish (Ctenopharyngodon idella), introduced into Lake Conway, Orlando, Florida, is being evaluated by the U.S. Army Engineer Waterways Experiment Station as a biological agent for control of such nuisance aquatic plants as hydrilla and Eurasian water milfoil. The test is designed not only to yield data on long-term effects of the herbivorous fish on the ecosystem, but also to predict stocking rates, sizes, and optimum time, and restocking intervals (if needed). Some objectives of the study are to determine: (1) effects of white amur on hydrilla and how to measure such effects; (2) effects of white amur on lake ecology--water quality, game fish, zooplankton, phytoplankton, reptiles, and amphibians; (3) long-range effects on the white amur, such as growth, mortality, and food habits; and (4) which waters are amenable to plant control using white amur. Lake Conway, which consists of the five pools of Lake Conway, Little Lake Conway, and Lake Gatlin, was chosen in part because its small number of inflows and outflows, and its stability of water level (2-3 ft annual variation). Three fish barriers will be erected to prevent escape of white amur. As additional protection, a monosex fish population is being developed, to be stocked in February 1977; intensive monitoring will continue for two to three years. (See also W78-11591) (Lynch-Wisconsin).
W78-11606

BASELINE DATA REPORT--LAKE CONWAY GRASS CARP PROJECT,
Florida State Game and Fresh Water Fish Commission, Orlando.
V. Guillory, R. Land, and R. Gasaway.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 97-112, 13 tab, 10 ref.

Descriptors: *White amur, *Biocontrol, *Baseline studies, *Lake Conway(FL), *Hydrilla verticillata, *Aquatic weed control, *Aquatic Plant Control Program, Ctenophyngodon idella, Fish, Florida, Species diversity, Trophic level, Life history studies, Sampling, Creel census, Abundance, Mammals, Waterfowl, Methodology, Lakes, Eutrophication, Water pollution effects.

So that effects of projected introduction of the herbivorous fish, white amur (grass carp), into Lake Conway, Florida to control the aquatic nuisance plant Hydrilla verticillata could be evaluated, baseline conditions in the lake system were studied. This report presents results from the first three months of study and describes methodology. Conclusions: (1) fish populations appear to be fairly stable according to species diverity analysis; (2) fish sampled in shoreline vegetation show higher species diversity but lower numerical abundance than fish collected in shallow, non-vegetated habitats; (3) a fairly large game fish population exists, but bluegill and redear sunfish show effects of overcrowding, with harvestable bluegill, redear sunfish, and largemouth bass in poor condition; and (4) the overall fish catch rate is low, but the predominance of bass fishermen and their low catch rates may account for the low overall rates. Evaluation of effects of white amur introduction is to be based on four techniques used in this study: (1) life history studies of fish of different trophic levels and habits (chain pickerel, bluefin killifish, bluegill, and largemouth bass); (2) fish sampling involving six methods (wegener ring, electrofishing, gill net, blocknet-rotenone, 10-ft seine, and 20 ft seine; (3) a creel survey to measure sport fishing; and (4) sampling of waterfowl and aquatic mammals by direct count. (See also W78-11591) (Lynch-Wisconsin).
W78-11607

AQUATIC MACROPHYTE SAMPLING IN LAKE CONWAY,
Florida Dept. of Natural Resources, Orlando. Bureau of Aquatic Plant Research and Control.
L. E. Nall, M. J. Mahler, and J. Schardt.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 113-122, 4 fig, 3 tab.

Descriptors: *White amur, *Lake Conway(FL), *Species composition, *Macrophytes, *Sampling,

*Biocontrol, *Aquatic Plant Control Program, Aquatic weed control, Methodology, Floral lists, Biomass, Aquatic plants, Florida, Ctenopharyngodon idella, Hydrilla verticillata, Nitella megacarpa, Vallisneria americana, Illinois pondweed, Potamogeton illinoensis, Lakes, Eutrophication, Water pollution effects.

Sampling of aquatic macrophytes in Lake Conway, Florida, is being conducted in connection with a project to introduce an herbivorous fish, white amur (Ctenopharyngodon idella), into the lake for biocontrol of Hydrilla verticillata. As very little biomass information has been collected during the first four months, this paper deals primarily with sampling methodology. An inventory of the 45 floral species found in Lake Conway is included, together with tables showing monthly species composition averages and fresh biomass of plants along transects. Objectives of the Lake Conway project are to observe: (1) changes in distribution, biomass, species composition, and condition of each plant species; (2) food preference of white amur; (3) removal rate of target species; (4) effect on desirable species, such as Vallisneria americana and Nitella megacarpa; and (5) interspecific competition among plant species while under stress from the white amur. For the macrophyte sampling 20 transects are sampled monthly at 100-m intervals. Samples are separated to species, weighed, dried, and reweighed, and reproductive structures are noted. Eighteen one-ha plots in representative areas of the lake are also sampled monthly by means of hand-removal of a 0.25-m square of vegetation in each plot by divers. Several five x five-m exclosures placed in heavily vegetated areas will serve as controls shielded from amur feeding. The most ubiquitous plant species in Lake Conway are nitella, Illinois pondweed, and Hydrilla. (See also W78-11591) (Lynch-Wisconsin).
W78-11608

BIOLOGICAL BASELINE STUDIES OF THE LAKE CONWAY, FLORIDA, SYSTEM,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
J. L. Fox, E. C. Blancher, F. M. Koojiman, R. A. Conley, and C. P. Feerick.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 123-145, 9 fig, 10 tab, 11 ref.

Descriptors: *Lake Conway(FL), *Baseline studies, *Trophic level, *Zooplankton, *Phytoplankton, *Benthic fauna, *Aquatic Plant Control Program, Mesotrophy, Eutrophication, Florida, Lakes, White amur, Ctenopharyngodon idella, Aquatic weed control, Biocontrol, Invertebrates, Methodology, Faunal lists, Floral lists, Periphyton, Algae, Distribution, Species diversity, Nutrients, Water pollution effects.

A baseline study of zooplankton, phytoplankton, periphyton, and benthic invertebrates is being conducted as part of a program to introduce the herbivorous fish white amur (Ctenopharyngodon idella) into Lake Conway, Florida for biological control of Hydrilla verticillata. There is much biotic and abiotic variation among the five pools of the Lake Conway system. Although a firm trophic designation is impossible as yet, mean hypolimnetic oxygen concentrations Secchi disc values, and chloropyll-a levels indicate mesotrophy. Biological parameters imply the East and West Pools and Lake Gatlin are somewhat eutrophic, while the South and Middle Pools are more oligotrophic. Biota examined thus far also indicate mesotrophy, but the large biomass of submersed vascular plants and microscopic algae may reflect excessive nutrient loading. Never theless, a preliminary nutrient budget shows a loading rate characteristic of a mesotrophic lake. Various tables give species lists of the biota sampled, and abundances of several taxa are figured. Twenty-one stations were sampled. Diaptomus floridanus, Cyclops varicans and Tropocyclops prasinus accounted for 95% of all copepods collected. The Shannon-Weaver diversity index for phytoplankton was relatively constant at 3.5-4.0. To date 56 species of benthic invertebrates have been collected. (See also W78-11591) (Lynch-Wisconson).
W78-11609

BACKGROUND WATER-QUALITY ANALYSIS OF LAKE CONWAY,
Orange County Pollution Control Dept. Orlando, FL.
A. T. Sawicki.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 146-158, 16 fig, 3 tab.

Descriptors: *Lake Conway(FL), *Water quality, *Seasonal, *Parameters, *Methodology, *Aquatic Plant Control Program, Nutrients, Phosphorus, Nitrogen, Dissolved oxygen, Carotenoids, Chlorophyll, Biochemical oxygen demand, Hydrogen ion concentration, Alkalinity, Lakes, Florida, *Eutrophication, *Water pollution effects.

Water quality in Lake Conway, Florida, has been monitored comprehensively since 1972 by the Orange County Pollution Control Department (PCD). Since January 1976 monitoring has been intensified under contract with the U.S. Army Engineer Waterways Experiment Station (WES). Comparison of historical data for 1972-76 with more recent data indicates that water quality is relatively stable, varies somewhat from pool to pool in the five-pool system, and is subject to seasonal and other short-term variations. Based on a comparison of eight selected parameters for the two data sets, several conclusions are offered: (1) Alkalinity and pH have small variations in means and standard deviations, and appear not to have significant seasonal variations. (2) Water quality in Lake Gatlin (one of the five pools) varied widely between 1972-76 as indicated by large standard deviations, but for unknown reasons in 1976 water quality in Lake Gatlin appears very similar to that in Lake Conway. (3) Seasonal trends for dissolved oxygen and nonastician carotenoids seem consistent for both the 1972-76 PCD data and the 1976 WES data; there seems to be an inverse seasonal relationship between the two parameters. (4) Incomplete data may account for lack of correlation of data from the PCD and WES monitoring of other parameters--biochemical oxygen demand, phosphorus, organic nitrogen, and chlorophyll-a. (See also W78-11591) (Lynch-Wisconsin).
W78-11610

PROPOSED RELATIONSHIPS BETWEEN WHITE AMUR AND THE AQUATIC ECOSYSTEM AT LAKE CONWAY, FLORIDA,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
K. C. Ewel, and T. D. Fontaine, III.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 159-176, 12 fig, 3 tab, 16 ref, 1 append.

Descriptors: *White amur, *Biocontrol, *Hydrilla verticillata, *Simulation analysis, *Model studies, *Aquatic weed control, *Ecosystems, *Lake Conway(FL), *Aquatic Plant Control Program, Ctenopharyngodon idella, Fish, Florida, Lakes, Forecasting, Nutrients, Phosphorus, Orthophosphate, Phytoplankton, Algae, Herbicides, Submerged plants, Chemcontrol, Integrated control, Eutrophication, Water pollution effects.

A model of the Lake Conway, Florida ecosystem is being developed to predict long-term effects of the use of white amur (Ctenopharyngodon idella), an herbivorous fish, to control excessive growths of Hydrilla verticillata. Effects of the fish on hydrilla, as well as on the entire ecosystem, are being simulated. As construction of the current model was accomplished before field work was begun and only a small amount of data was available, the model represents a generalized model for a Florida lake, not specifically Lake Conway. The most important factors controlling the lake ecosystem are considered to be solar energy, water temperature, and rainfall/runoff with associated phosphorus inputs. Modelling show that: (1) White amur used as the primary agent may not achieve control of hydrilla for six years. (2) White amur in conjunction with herbicides achieve control much more rapidly. (3) If the model correctly assumes that native submersed plants derive all nutrient needs from sediments, then they are little affected by changes in hydrilla population or dissolved orthophosphate levels. (4) Native submersed plants and probably also hydrilla appear to act as nutrient pumps, leaching sediment-derived nutrients into the water, and release of nutrients from hydrilla or white amur will result in at least temporary algal blooms. An appendix includes the program listing for the simulation model. (See also W78-11591) (Lynch-Wisconsin)
W78-11611

CULTURE TECHNIQUES FOR THE PRODUCTION OF MONOSEX WHITE AMUR,
Fish Farming Experimental Station, Stuttgart, AR.
A. E. Thomas.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 177-186, 9 fig, 3 tab.

Descriptors: *Lake Conway(FL), *Monosex fish, *White amur, *Gynogenesis, *Sex reversal, *Biocontrol, *Methodology, *Aquatic Plant Control Program, Ctenopharyngodon idella, Fish, Aquatic weed control, Florida, Research equipment, Spawning, Marking techniques, Eutrophication, Water pollution effects.

Efforts to produce monosex white amur (Ctenopharyngodon idella) for control of aquatic vegetation are reviewed. Research on artificial gynogenesis since 1972 has resulted in poor survival rates. Research on another technique, sex reversal, is still in experimental stages. Gynogenesis is the development of an ovum after penetration by a spermatozoan, but with no genetic contribution from the male. The usual process is to destroy chromosomes through denaturing the DNA in the sperm with ultraviolet light. Israeli carp (Cyprinus carpio) males were used as sperm donors because any chromosomal material not destroyed by the ultraviolet radiation will produce a lethal hybrid. Newly hatched diploid fry swim upward, are carried through an overflow drain, and are collected in small trough baskets. Haploid and hybrid fry normally remain in the hatching pot, deformed and less active. Only 0-3.6% of the eggs develop into diploid fry; most become haploids with only half the normal chromosomes. In the tests haploids and hybrids died within 24 hrs; diploids developed normal, all-female grass carp. In sex reversal, diploid fry are fed male sex hormones, and fish changed to functional males while having only female sex chromosomes are mated with normal females to produce all-female offspring without the reduced survival with gynogenesis. Equipment and marking techniques are discussed, as well as fish available for the Lake Conway, Florida, white amur project. (See also W78-11591) (Lynch-Wisconsin)
W78-11612

RESPONSE OF HYDRILLA TO VARIOUS HERBICIDES,
Texas Parks and Wildlife Dept., San Antonio. State Wide Noxious Vegetation Control Program.
L. V. Guerra.

In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 187-194, 7 fig, 1 tab.

Descriptors: *Hydrilla verticillata, *Herbicides, *Chemcontrol, *Texas, *Aquatic weed control, *Aquatic Plant Control Program, Rates of application, Toxicity, Mortality, Aquathol, Aqua-Kleen, Banvel, Hydout, Tubers, Eutrophication, Water pollution effects.

Granulated and liquid herbicides were tested on Hydrilla verticillata, a serious problem in Texas in neotropical waters and slightly acid waters of deep piney woods. The objective was to rate and rank the four granulated herbicides for total effectiveness, and to evaluate liquid herbicides in various combinations and in liquid vs inverted solutions. For granular herbicides over 90% plant destruction was achieved in 90 days, and 96.5-100% mortality was sustained for 210 days. The overall yearly average was about 85% mortality. Liquid formulations were slower to react; 150 days were required to obtain 80% plant kill, which lasted only 120 days. The overall yearly average was slightly below 60%. Explanations for the poorer performance of the liquid herbicides include acidity of the water, lower temperatures during cooler months, and overtreatment with granular herbicides. The tests indicate: (1) hydrilla can be treated with various herbicides to achieve desired mortality levels; (2) timing can be programmed so that treatment of large areas coincides with peak recreational usage; (3) ever-decreasing number of tubers show control is feasible; (4) control measures used in this study can prevent wide dispersal of hydrilla when less than 2000 acres are infested; (5) soil treatment should be investigated when plants have been destroyed or are beginning to come up. Herbicides tested included Aquathol G, Aqua-Kleen-20, Banvel XP, Hydout. (See also W78-11591) (Lynch-Wisconsin)
W78-11613

UPTAKE AND METABOLISM OF DIMETHYLAMINE SALT OF 2,4-D BY FISH,
Syracuse Research Corp., New York.
For primary bibliographic entry see Field 5C.
W78-11614

CHARACTERIZATION AND EVALUATION OF POLYMERS CONTAINING HERBICIDES AS PENDENT SIDE CHAINS,
Wright State Univ., Dayton, OH. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W78-11615

DEVELOPMENT AND EVALUATION OF CONTROLLED RELEASE HERBICIDES,
Creative Biology Lab., Inc., Barberton, OH.
G. A. Janes.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 217-220, 3 tab.

Descriptors: *Herbicides, *Controlled-release herbicides, *2,4-D, *Polymers, *Aquatic weed control, *Aquatic Plant Control Program, Diquat, Silvex, Fenac, Fenuron, Endothall, Bioassay, Chronicity, Temperature, Rubber, Pesticide residues, Rates of application, Eutrophication, Water pollution effects.

Tests were conducted to establish effective dosages of controlled-release herbicide formulations of Diquat, 2,4-D acid, Silvex, Fenac acid, Fenuron, and Endothall. Formulations were prepared at 100%, 90%, 50%, and 25% of their respective maximum loadings in various elastomeric bases. Initial loss rate analyses indicate successful release of toxicants. Elastomers used were hot polymerized styrene-butadiene copolymer, cold polymerized styrene-butadiene copolymer, natural rubber, synthetic natural rubber, cis polybutadiene, and an ethylene-propylenediene terpolymer. Master-batch formulations and maximum loadings are given in tables. Spectrophotometric standard curves determined for 2,4-D acid, Diquat, and Silvex were used to establish loss rates of agents from each of the polymer bases at the various loading levels at 70 and 80F. A table gives release rates for 2,4-D acid at 70F from hot and cold polymerized styrene-butadiene and cis polybutadiene formulations. In each case the formulations show significant controlled-release efficacy, and essentially all the 2,4-D from the highest loading CB rubber was released in 100 days. Early data for Diquat show excessively high release. Earlier chronicity studies demonstrated the ability of Silvex, Diquat, and 2,4-D acid to destroy weeds at 0.01-0.001 ppm/day. Bioassay tests with cabomba and milfoil have shown effective controlled-release treatment by Fenac and Endothall over a 30-day period. (See also W78-11591) (Lynch-Wisconsin)
W78-11616

EFFICACY EVALUATION OF CONTROLLED-RELEASE HERBICIDES,
University of Southwestern Louisiana, Lafayette. Dept. of Plant Industry.
J. R. Barry.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program,, 19-22 October 1976, Atlantic Beach, Florida. p 221-223, 1 tab.

Descriptors: *Controlled-release herbicides, *Herbicides, *Aquatic weed control, *2,4-D BEE, *Fenac, *Copper sulfate, *Aquatic Plant Control Program, Water hyacinth, Eichhornia crassipes, Hydrilla verticillata, Egeria densa, Eurasian water milfoil, Myriophyllum spicatum, Coontail, Ceratophyllum demersum, Louisiana, Rubber, Rates of application, Eutrophication, Water pollution effects.

Efficacy of eight controlled-release formulations of the herbicides 2,4-D BEE, copper sulfate, and Fenac was tested on five nuisance aquatic plant species in experimental pools. Formulations were: (1) rubber-2,4-D BEE, with CBL Number 14 ACE containing 18.7% 2,4-D BEE with a release life of two years at 10, 20, and 40 ppm; (2) rubber-copper sulfate monohydrate, with CBL Number E51 containing 17.5% Cu++ with a release life of 5-7 months at 25, 50, and 100 ppm; and (3) a polyethylene-Fenac wafer containing 20% Fenac acid, 70% polyethylene, and 8% iron oxide at 30 and 60 ppm. Species tested were water hyacinth (Eichhornia crassipes), Hydrilla verticillata, Egeria densa, Eurasian water milfoil (Myriophyllum spicatum), and coontail (Ceratophyllum demersum). Triplicate pools (3 m sq x 0.5 m deep) were treated with each of the formulations (plus a control); each pool contained 12 hyacinth plants and duplicate flats of each submersed species. Pools were filled to 0.3 depth; plants were added on July 12-13, 1976, and treated with herbicides on July 29. Visual ratings were made in August, September, and October. Rubber-2,4-D BEE eliminated M. spicatum at all rates and substantially damaged C. demersum and E. crassipes at 40 ppm. All species were sensitive to rubber-copper sulfate, and C. demersum was eradicated. Polyethylene-Fenac killed all M. spicatum and C. demersum plants at both rates, and egeria at 60 ppm. The rates tested appear to exceed those necessary for chronicity. (See also W78-11591) (Lynch-Wisconsin)
W78-11617

PROGRESS IN THE USE OF PLANT PARTHOGENS AS BIOLOGICAL CONTROLS FOR AQUATIC WEEDS,
Florida Univ., Gainesville. Dept. of Plant Pathology.
R. Charudattan, T. E. Freeman, and K. E. Conway.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 224-229, 11 ref.

Descriptors: *Aquatic weed control, *Biocontrol, *Pathogenic fungi, *Cercospora rodmanii, *Acremonium zonatum, *Water hyacinth, *Aquatic Plant Control Program, Plant pathology, Eichhornia crassipes, Hydrilla verticillata, Water hyacinth rust, Uredo eichhorniae, Integrated control, Neochetina eichhorniae, Water hyacinth weevils, Orthogalumnia terebrantis, Water hyacinth mite, Florida, Insects, Rusts, Pathogenic bacteria, Host specificity, Eutrophication, Water pollution effects.

Several biological control agents for water hyacinth (Eichhornia crassipes) and Hydrilla verticillata are being tested at various sites; hyacinth agents included: (1) two fungal pathogens, Cercospora rodmanii and Acremonium zonatum; (2) water hyacinth rust, Uredo eichhnorniae; (3) two arthropods, the water hyacinth weevil (Neochetina eichhorniae), and the water hyacinth mite, Orthogalumna terebrantis; and (4) integrated control with the two insects and A. zonatum. Agents for hydrilla are mentioned only briefly in this paper. The two pathogenic fungi C. rodmanii and A. zonatum have proved successful control agents; the former is being considered for mass production and experimental releases. A. zonatum, capable of extensive damage to hyacinth by itself, is more efficacious in an integrated biological control scheme with N. eichhorniae and O. terebrantis. In south Florida interaction between the arthropods and A. zonatum occurs naturally, but existing levels of A. zonatum are too low for effective control and must be supplemented. In integrated biocontrol experiments a combination of N. eichhorniae and A. zonatum killed all hyacinth in 52 days. Plants treated with N. eichhorniae alone were severely damaged but alive, while those treated with A. zonatum alone were moderately infected and alive. Studies of the obligate rust pathogen of water hyacinth U. eichhorniae have shown this fungus to be another significant host-specific biological control agent for water hyacinth. (See also W78-11591) (Lynch-Wisconsin)
W78-11618

PRELIMINARY RESULTS OF INTEGRATING CHEMICAL AND BIOLOGICAL CONTROLS TO COMBAT WATER HYACINTH,
Agricultural Research Service, Fort Lauderdale, FL.
B. D. Perkins.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 230-235, 6 fig, 10 ref.

Descriptors: *Water hyacinth, *Biocontrol, *Chemcontrol, *Integrated control, *2,4-D, *Water hyacinth weevils, *Aquatic Plant Control Program, Neochetina eichhorniae, Aquatic weed control, Eichhornia crassipes, Florida, Herbicides, Feeding rates, Eutrophication, Water pollution effects.

Plots of water hyacinth (Eichhornia crassipes) infested with water hyacinth weevils (Neochetina eichhorniae) were selectively sprayed with 2,4-D at 2 lbs/acre in April 1976 near Fort Lauderdale, Florida to assess effects of integrated biological and chemical control of the plant. The herbicide greatly reduced hyacinth density from 61 to two plants/sq m, and slight regrowth by August (to 15 plants/sq m) was heavily attacked by increasing weevil populations. Weevils apparently were attracted to treated plants, possibly due to release of a kairomone from growing plant tissue. In the experiments six 8 x 8 m field plots were demarcated;

three were sprayed with 2,4-D, and three served as controls. Four plants inside and four plants outside the plots were sampled monthly during April-October. The density of plants outside the treated plots paralleled that inside and outside controls. Adult weevils and plants increased steadily outside controls from 0.7 to 2.4, and inside controls from 1.7 to 3.5; outside the treated plots the population decreased initially from 1.5 to 0.3, while inside it initially increased from 1.2 to 2.5, implying movement into the treated plots. The number of feeding spots on leaves followed a similar pattern. At this time many petioles inside the treated plots elongated from the 2,4-D treatment, and were heavily fed upon by adult weevils. Thereafter, the adult population decreased rapidly in the treated plots as plants deteriorated, reaching 0.3/plant by mid-September; outside treated plots the population increased to 2.9. (See also W78-11591) (Lynch-Wisconsin)
W78-11619

CONTROLLED FIELD TESTS OF SELECTED INSECTS AND PATHOGENS IN COMBINATION ON WATER HYACINTHS,
Army Engineers Waterways Experiment Station, Vicksburg, MS.
E. E. Addor.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 236-268, 11 fig, 15 ref, 1 append.

Descriptors: *Water hyacinth, *Integrated control, *Biocontrol, *Cercospora rodmanii, *Acremonium zonatum, *Arzama densa, *Neochetina eichhorniae, *Aquatic Plant Control Program, Water hyacinth mite, Water hyacinth weevils, Orthogalumna terebrantis, Tetranychus, Brownout, Insects, Eichhornia crassipes, Pathogenic fungi, Host specificity, Plant pathology, Louisiana, Lake Concordia(LA), Epiphytology, Aquatic weed control, Lakes, Eutrophicaton, Water pollution effects.

Although various combinations of four biocontrol agents tested on water hyacinth in Lake Concordia, Louisiana effectively controlled plant growth, various unanticipated experimental problems and extraneous influences made it impossible to positively evaluate the effects of each control agent. Complications included organisms found on plots to which they had not been introduced, agents not found on plots to which they had been applied, and appearance of two control organisms not part of the tests--the water hyacinth mite, Orthogalumna terebrantis, and a spider mite, Tetranychus cf. gloveri. Introduced agents were: (1) two pathogenic fungi, Cercospora rodmanii and Acremonium zonatum; and (2) two insects, the water hyacinth weevil Neochetina eichhorniae and a noctuid moth Arzama densa. Subjective evaluation of results suggests that: (1) some combination of Arzama, Neochetina, Cercospora, and Orthogalumna (all of which survived the first winter) established and sustained a debilitating epiphytotic; (2) Arzama and Neochetina apparently attack the most vigorous plants; (3) Cercospora virulence is enhanced by insect activity; (4) Orthogalumna, probably introduced with Neochetina, seems to have exerted stress on hyacinth; (5) Acremonium did not appear to contribute significantly to the epiphytotic; and (6) various fungi, bacteria, and viruses may contribute to the epiphytotic. In the tests 64 floating plot frames were stocked with hyacinth (Eichhornia crassipes) in May 1975; observations have continued through fall 1976. (See also W78-11591) (Lynch-Wisconsin)
W78-11620

REMOTE SENSING OF AQUATIC PLANTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 7B.
W78-11621

DATA MANAGEMENT SYSTEMS IN THE AQUATIC PLANT CONTROL RESEARCH PROGRAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 7C.
W78-11622

THE INDUSTRIAL WASTE STUDIES PROGRAM. SUMMARY REPORT ON THE AUTOMOBILE INDUSTRY.
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 315, Price codes: A02 in paper copy, A01 in microfiche. March 1972. 7 p, 2 tab, 1 append.

Descriptors: *Automobile industry, *Industrial wastes, *Effluents, *Water pollution control, *Waste water treatment, *Standards, Environmental Protection Agency, Technology, Regulation, Pollutants, Water pollution sources, Engineering, Heavy metals, Biochemical oxygen demand, Suspended solids, Oil pollution.

Wastewater treatment technology of the automobile industry is reviewed in this summary report by the Environmental Protection Agency. Data was collected through the Industrial Waste Studies Program to develop effluent limitation guidelines. The report is based on data provided by private firms concerning wastewater involved, available control and treatment technology, and achievable effluent levels. As these data were considered inadequate for determining effluent limitation guidelines, additional data will be collected. However, certain engineering judgments regarding technically achievable effluent levels have been made by EPA technical experts, and these judgments are presented in this report, together with sources of descriptive matter and data relevant to this industry. Background data collected were published in a separate report. Tables in this summary present: (1) Two groups of significant wastewater parameters, those for which effluent levels should be established, and those for which limitation levels should be considered. (2) A list of parameters, and available treatment methods. (3) Achievable effluent levels for 11 parameters. This study was restricted to engines and vehicle assembly; all other aspects were omitted. Parameters for which achievable effluent levels are given are: BOD5, total chromium, copper, cyanide, iron, nickel, oil and grease, phenols, phosphorus, suspended solids, and zinc. (Lynch-Wisconsin)
W78-11629

MANURE MANAGEMENT IN AN IRRIGATED BASIN RELATIVE TO SALT LEACHATE TO GROUND WATER,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
P. F. Pratt, S. Davis, and A. E. Laag.
Journal of Environmental Quality, V 6, No 4, p 397-402, Oct-Dec, 1977. 7 fig, 2 tab, 10 ref.

Descriptors: *Solid wastes, Irrigation, *Leaching, Cations, *Salts, Calcium, Potassium, Magnesium, Sodium, Farm wastes, *Dairy wastes.

Data from a four-year experiment with animal manures were extrapolated to a hypothetical irrigated basin to test the effects of (1) distribution of manure within the basin, (2) export of manure from the basin, and (3) water management on leaching of the salts added in irrigation waters and manures. The experimental plan had two parts. The first was a comparison of 6 treatments with animal manures, including a check treatment, each at 2 rates of application of irrigation water on Hanford soil. The second was a comparison of one manure treatment (79 metric tons of dairy manure on a dry weight basis per ha per year) on three soils at 2 irrigation rates. In all cases 3 replications were used. Plot size was 15 m by 15 m, with guard areas of the same size. The cropping sequence, consisting of barley in the winter and sudangrass in the summer, went through 4 complete cycles. Leachate volumes for the higher water treatment were about double those for the lower water treatment, except for the Hanford soil at the highest manure rate, where the difference between the 2 water treatments was only 25%. Also, the leaching volume was consistently lower for the Ramona and Domino soils than for the Hanford soils. Large amounts of Ca, K, and Mg were accumulated in the soil, but there was a net loss of Na. Practically no K moved beyond the 1.5 m depth. As the rate of manure increased, the percent leaching of the cations added in water and manures decreased. Extrapolation of the field data to a 18,200 ha irrigated basin and a production of 364,000 metric tons of dairy manure per year revealed that the amount of salt leached to groundwater in the basins could be reduced by applying the manure at relatively high rates on a fraction of the irrigated land and by export of manure from the basin. However, reductions were small in comparison to the effects of irrigation water management to obtain small leachate volumes. It might be viable to concentrate manure on soils having low water transmissivities which yield low leachate volumes with most irrigation systems. (Merryman-East Central)
W78-11632

FEDERAL GRANTS AWARDED FOR CONSTRUCTING WASTE TREATMENT FACILITIES WHICH BENEFIT INDUSTRIAL USERS.
Comptroller General of the United States, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 286, Price codes: A03 in paper copy, A01 in microfiche. Report B-166506-700508, May 1970. 34 p, 4 append.

Descriptors: *Federal government, *Grants, *Federal Water Quality Administration, *Treatment facilities, *Construction costs, *Industrial wastes, Cities, Waste treatment, Municipal wastes, Federal Water Pollution Control Act, Pollution abatement, Water pollution control, Administration, Public policy.

The Federal Water Quality Administration's (FWQA) policy of awarding grants to municipalities to help finance construction of waste treatment facilities for treatment of substantial quantities of industrial wastes was reviewed by the General Accounting Office. The review was intended primarily for gathering information on the number and amounts of construction grants. FWQA has awarded grants for facilities to treat: (1) domestic wastes only, (2) industrial wastes only, and (3) domestic and industrial wastes. Industrial plants have not been required to finance any part of construction costs of treatment facilities, and any contribution to such costs by the industry has resulted from agreements between the industry and the sponsoring municipality. Grants of up to 55% of total eligible cost are awarded by FWQA, with provision that the municipality assume jurisdiction over the facility. A partial list of projects in which industrial wastes were 50% or more of total volume of wastes showed grants of about $81 million for 381 facilities, estimated to cost about $360 million. At least 44 of the 381 facilities were designed to process 75% or more industrial wastes. In three FWQA regions, seven facilities were located which treat industrial wastes only; grants to the municipalities totalled $503,000. Factors are discussed which should be considered in determining the extent to which industry should contribute to construction costs of waste treatment facilities. (Lynch-Wisconsin)
W78-11633

THE ECONOMICS OF POLLUTION,
D. Pearce.
In: Environment and the Industrial Society, Holmes, N. (editor) Westview Press, Boulder, Colorado, 1977. p 165-190. 11 ref.

Descriptors: *Economics, *Pollution abatement, *Water pollution control, *Environmental economics, *Ecology, *Methodology, Environmental effects, Damage functions, Analytical techniques, Polluter-pays principle, Pollution taxes(Charges), Regulation, Standards, Cost-benefit theory, Cost-benefit analysis, Aesthetics, Value.

This overview of various theories of pollution control methods concludes that economics alone offers no answers to environmental problems, but does provide techniques and a framework for solving some problems. The problems themselves raise questions about the relevance of values upon which economic solutions are based. Conventional economic doctrine defines man in terms of self-interest, and prescribes policies based on criteria designed to realize the aim of economic man; what exists becomes what is good. Critics argue that ecologic criteria should be substituted for economic criteria in addressing environmental problems. A middle group accepts some limitations on the ability of economics to prescribe policies for environmental problems, but holds that criteria should nevertheless be rooted in economics. This study reviews such approaches as pollution taxes and pollution standards and discusses the polluter pays principle, under these headings: (1) the nature of the economic debate, (2) conventional analysis, (3) free markets as a solution, (4) making the polluter pay, (5) some criticisms of tax solutions, (6) ecology and economics, and (7) conclusion. Among criticisms of pollution taxes is that of the intangible nature of abatement benefits, and the possibility that people do not always translate such losses as scenery or the lives of the members of their family into money values; values computed by the economist are not exhaustive. It is concluded that many value systems cannot be dealt with using cost-benefit analysis. (Lynch-Wisconsin)
W78-11634

KAPLAN'S BLUEPRINT FOR FEEDLOT UTOPIA.
Calf News, V. 16, No 1, p. 16, 18, March, 1978. 2 fig.

Descriptors: *Feed lots, *Recycling, Methane, *Anaerobic digestion, Economics, Feasibility studies, Standards, Refeeding, Protein fermentation product, Hamilton Standard.

Don Kaplan, feedlot operator in Bartow, Florida, is on the verge of accomplishing a feedlot system which will: convert steer manure into a high-protein feed, produce from the manure the power to run his plant (with excess energy to sell), and provide an odorless, fly-free completely water-contained feedlot with no runoff. The technological input for this system is being provided to Hamilton Standard of Windsor Locks, Ct., a division of United Technologies, which has been studying the anerobic fermentation process for seven years. The Department of Energy recently awarded a research grant of $938,000 to Hamilton Standard and Kaplan Industries to build the first full-scale conversion plant for 10,000 head of cattle at the Kaplan feedlot to produce a 25 percent protein feed supplement called protein fermentation product (PFP) and to produce methane gas. This first of three reports concerning this conversion plant discusses the PFP portion of the recycling system. In a single cell anaerobic fermentation system, the protein of the raw stock (manure) is upgraded from 10 percent to roughly 23-25 percent. If PFP is considered as having 60 percent of the protein content of cottonseed meal, it is worth about $80 per ton. One of the major reasons that the Department of Energy funded the system, besides proving it technologically feasible, was to prove the economic viability so that other feedlot operators will want such a system -- not only because it will make them environmentally secure, but because they can make a profit from it. The Hamilton Standard process costs about $100 per head. (Merryman-East Central)
W78-11650

ORGANIC POLLUTION OF BOTTOM MUD IN THE SETO INLAND SEA AND ITS REMOVAL EXPERIMENT,
Nansei Regional Fisheries Research Lab., Hiroshima (Japan).
A. Murakami.
Bulletin of the Nansei Regional Fisheries Research Laboratory, No. 10 (1976), p. 53-72, 5 tab, 13 tab, 13 fig, 6 ref.

Descriptors: *Sediments, *Toxicity, Commercial fisheries, Water pollution, Water pollution effects, *Pulp and paper industry, *Eutrophication, Red tide, Organic matter, Organic wastes, *Dredging, Waste treatment, *Seto Inland Sea, Japan, Osaku Bay, Hiroshima Bay.

Organic pollution of bottom mud in the Seto Inland Sea has been observed near the pulp mill effluent pipe since 1950. The polluted bottom mud has been dredged by a pump. The dredged mud is treated and dewatered. The sludge is deposited on land. It is hoped that the removal of the contaminated sludge will help restore the fisheries. (EIS-Katz)
W78-11659

ENGINEERS OUTLINE WASTE DESIGN FACTORS,
R. J. Smith, T. E. Hazen, and G. B. Parker.
National Hog Farmer, p 4-6, Jan., 1974. 1 fig.

Descriptors: *Swine wastes, Waste management, Slatted floors, Oxidation ditch, Land disposal, *Farm wastes, *Design, *Waste storage, Lagoons, Aerobic conditions, Anaerobic conditions, Odor, Groundwater pollution, Crop response, Nutrients, Copper, Costs.

This article gives design factors for different manure handling systems. There are four main elements in an integrated manure handling system -- transport, treatment, storage, and land application. Three types of manure management systems are presented: (1) Slatted floor with underfloor pit storage. Advantages are: (a) simple, fairly low investment cost, (b) high retention of fertilizer nutrients, (c) suitability for small operators using batch farrowing. Disadvantages are: (a) difficult to pump out, (b) odor, (c) danger of gas poisoning during pre-pump agitation, (d) tank contents must be hauled. (2) Slatted floor with underfloor oxidation ditch. Advantages are: (a) low odor levels, (b) manure rendered sufficiently liquid to allow pumping, (c) ventilation requirements lower in winter, (d) possibilities of refeeding. Disadvantages are (a) external storage required to handle overflow, (b) continual maintenance and power cost, (c) possibility of disease transmission. Presently there are five areas of concern in relation to land disposal and nutrient loading: nitrate leaching into groundwater, excessive phosphorus and the effects on reed germination, high soil copper levels and plant uptake, excess potassium and magnesium deficient plants, and salt buildup in the soil. No swine producer should consider new facilities without first calculating how much ground is required for his final disposal area. Treated effluents are like fertilizers, and any big operator should maintain records of the amount of liquid pumped out of his system and the cumulative amounts of N, P, and K in the soil. It's anticipated that the state may require such data in the future. Based on the design criteria presented, the investment costs for a manure handling system can be estimated. (Bates-East Central)
W78-11668

CONTROL OF NONPOINT WATER POLLUTION FROM AGRICULTURE: SOME CONCEPTS,
Agricultural Research Service, Chickasha, OK.
M. H. Frere, D. A. Woolhiser, J. H. Caro, B. A. Stewart, and W. H. Wischmeier.
Journal of Soil and Water Conservation, V. 32, No. 6, p. 260-264, Nov.-Dec., 1977. 6 fig., 13 ref.

Descriptors: *Management, Erosion, Leaching, *Agricultural runoff, Fertilizers, *Wates pollution control, *Federal Water Pollution Control Act Amendments of 1972, *Non-point pollution sources, Flow charts, Pesticides.

The Federal Water Pollution Control Act Amendments of 1972 require the control of nonpoint as well as point sources of pollution. Non-point sources are not discrete and identifiable. The best way of controlling pollution from these sources is not by means of a treatment plant; rather it is by land management. Methods of control can be classified into two groups: (1) methods applicable to broad areas, including education incentives, taxation, and legal penalties, and (2) farming practices that are site-specific because of climate, topography, economics, etc. A set of flow charts has been developed which assesses erosion problems and controls over large areas; evaluates erosion problems and selects physically feasible control practices for field-sized areas; assesses potential nutrient pollution from fertilizer or animal wastes, leaching, runoff, and erosion; and assesses potential pollution from pesticides. A master flow chart shows the general procedure to be followed. The scheme depends on answers to a set of sequential questions in the other flow charts. The flow charts should help user select farming practices to reduce nonpoint pollution and evaluate their consequences. (Bates-East Central)
W78-11681

AVOIDANCE CHAMBER RESPONSES OF MAYFLY NYMPHS EXPOSED TO EIGHT HERBICIDES,
Fish and Wildlife Service, Denver, CO. Fish-Pesticide Research Lab.
For primary bibliographic entry see Field 5C.
W78-11685

THE SPORT FISHERY OF THE UNCHANNELIZED AND CHANNELIZED MIDDLE MISSOURI RIVER,
South Dakota Univ., Vermillion. Dept. of Biology.
C. L. Groen, and J. C. Schmulach.
Transaction of the American Fisheries Society, Vol. 107, No. 3, p. 412-418, 1978. 1 fig., 4 tab., 25 ref.

Descriptors: *Missouri River, *Freshwater fish, South Dakota, Nebraska, Iowa, Missouri, *Fish harvest, Fish management, *Fish populations, Fish types, Fisheries, Fishing, Recreation, Dams, Tailwaters, *Channeling, Channel improvements, Carp, Channel catfish, Bass, Gavins Point Dam, *Channelized River, *Unchannelized River, Angler hours, Anler days, Annual catch, Harvest rate, Angling effort.

A catch survey of 502 km of the Missouri River was conducted from July 1, 1972 to June 30, 1973. The study area encompassed the Gavins Point Dam tailwaters (6.4 km), 84 km of unchannelized river and 412 km of channelized river. The fishery supported 412,660 angler hours (98,252 angling days) valued at $720,047. Anglers averaged 0.47 and 0.33 fish/h for annual catch and harvest rates, respectively. Catch rate includes fish not kept. The greatest angling effort and harvest occurred in the tailwaters, but the unchannelized river supported the highest annual catch and harvest rates, 0.72 and 0.50 fish/h. The unchannelized river also exceeded the channelized river in angler-hours/km, number of fish caught/km, weight harvested (kg/km) and average size of creeled fish. Sauger, channel catfish, and white bass were the most abundant species creeled in the unchannelized river compared to carp, channel catfish, and freshwater drum in the channelized section. The harvest rates indicated that the standing crop of sport fish was considerably greater in the unchannelized than the channelized river. More back-water

aquatic habitat and greater habitat diversity in the unchannelized river probably accounted for population abundance differences. (EIS-Katz).
W78-11709

UPTAKE OF WATER-SOLUBLE GASOLINE FRACTIONS AND THEIR EFFECT ON OXYGEN CONSUMPTION IN AQUATIC STAGES OF THE MOSQUITE (AEDES AEGYPTI (L.),
Vermont Univ., Burlington. Dept. of Zoology.
W. O. Berry, J. D. Brammer, and D. E. Bee.
Environmental Pollution, Vol. 15, 1978, p. 1-22. 4 tab., 9 fig., 19 ref.

Descriptors: *Oil, *Oil pollution, *Aquatic insects, Pesticides, Insecticides, Respiration, Gasoline, Aquatic amines, Dissolved oxygen, Water pollution effects, Oxygen requirements, Bioassay, Laboratory tests, Animal physiology, Animal metabolism, *Mosquitos, Aeds aegypti, Aquatic stages, Benzene, Toluene, Xylenes, Gasoline, Gasoline fractions, Mosquito larvae.

Oxygen consumption in aquatic stages of the mosquito (Aedes aegypti (L.) was measured following a 24-h pretreatment in sublethal doses of water-soluble fractions from whole gasoline or its individual components (Benzene, toluene and xylenes). A significat increase in 02 consumption occured in treated-fed larvae following exposure to water-soluble fractions from either 1 ml gasoline/liter water or a mixture of 0.2 ml benezene and 0.2 ml toluene/liter water. No significant differences in respiration were observed in either unfed larvae or fed larvae pretreated with the separate fractions or combinations of xylenes with benzene or toluene. Uptake and discharge of toluene by 4th-instar larvae were measured in solutions containing water-soluble amount of H3, toluene alone and in combination with benzene. These experiments suggest that water-soluble gasoline fractions are taken up by food particles and assimilated by the insects via feeding. The respiratory response of the larvae appears to be due to a synergistic effect of benzene and toluene that may effect coal permeability. (EIS-Katz).
W78-11710

CONTROL OF CHIRONOMIDS IN MILKFISH (CHANOS CHANOS) PONDS WITH ABATE (TEMEPHES) INSECTICIDE,
Taiwan Fisheries Research Inst., Tainan. Fish Culture Station.
S. C. Tsai.
Transactions of the American Fisheries Society, Vol. 107, No. 3, p. 493-494, 1978. 4 tab, 2 fig, 13 ref.

Descriptors: Toxicity, *Bioassay, Mortality, Aquiculture, *Phosphothioate pesticides, *Mullets, *Shrimp, Aquatic insects, Crustaceans, Parasitism, Mollusks, Copepods, Algae, Benthic flora, Fish establishment, Fish farming, Fish havest, *Aquiculture, *Chironomids, *Milkfish, Chanos, *Abate, *Temephos.

Larval chironomids (Chrionomus longilobus (Kieffer)) are serious competitors with milkfish Chanos chanos (Forskal) for benthic algae in commercial milkfish ponds in Taiwan. Chironomid larvae were effectively killed with temephos (Abate, 0,0,0', -tetramethyl 0,0'-thiodi-p-phenylene phosphorothioate) 59% emulsifiable concentrate when it was diluted 1:2,000 with seawater and applied to milkfish ponds to establish a concentration of 0.050 mg/liter of the active ingredient. This treatment did not harm milkfish and benthic algae. Residues found in the edible portions of milkfish after seven applications of Abate 50% emulsifiable concentrate ranged from 0.02 to 0.08 mg/kg, well below the 1.0 mg/liter approved by the World Health Organization for presence in human drinking water. The acute toxicity of Abate 50% EC to 13 other species of aquatic animals was determined in the laboratory. (EIS-Katz)
W78-11711

HUGE LOADS FUND WORLD'S LARGEST SEWAGE WORKS.
World Water, Vol 1, No 1, p 11, May, 1978.

Descriptors: *Sewerage, *Treatment facilities, *Loans, *Financing, *Interceptor sewers, Pumping plants, Sewage treatment, Sanitary engineering, Sewage disposal, Waste water treatment, Municipal wastes.

The world's largest sewage treatment plant, planned for Sao Paulo, Brazil, will serve a population of 5.5 million and extend sewerage to 55% of the city's 10.6 million inhabitants. The $1,240 million Sanegram project is being partially funded by the Sao Paulo Water and Scwerage Fund, the Banco Nacional de Habitacao, and by a loan for $110 million from the World Bank. The sewerage system will contain 5,500 km of collectors, 60 km of interceptors, and 10 pumping stations. The largest treatment plant will have a capacity of 63 cu m/sec; two major secondary and two smaller plants are also planned. Consulting engineers for the project are Metcalf and Eddy. (Lisk-FIRL)
W78-11756

ELIMINATION OF FECAL COLIFORM BACTERIA FROM SOIL IRRIGATED WITH MUNICIPAL SEWAGE LAGOON EFFLUENT,
Singapore Univ. Dept. of Microbiology.
R. G. Bell, and J. B. Bole.
Journal of Environmental Quality, Vol. 7, No. 2, p 193-196, April-June, 1978. 3 tab, 17 ref.

Descriptors: *Coliforms, *Sewage bacteria, *Spray irrigation, *Application methods, *Penetration, Sewage disposal, Grasses, E coli, Evapotranspiration, Enteric bacteria, Ultimate disposal, Waste water treatment, Municipal wastes.

Sewage lagoon effluent was applied by spray irrigation at a rate of about 4.5 cm/week to two Brown Cavendish loamy soil plots planted with reed canarygrass. The study was performed to examine the distribution and viability of fecal coliforms in the soil. Soil samples to a dept of 130 cm were collected weekly; fecal coliforms were enumerated after the first vegetation cutting, after the second cutting, and after a single fall irrigation. Coliforms never moved below a depth of 69 cm and were concentrated primarily within the top 8 cm of the soil. The initial 48 hrs after irrigation yielded a die-off rate of about 90%. The remaining 10% of the coliforms were diminished at a much slower rate over a period of about 2 weeks in the planted plots. Fecal coliform populations in the soil irrigated once after canarygrass harvesting remained detectable for 8 wks; the death rates of the coliforms doubled for each 10C increase in temperature. (Lisk-FIRL)
W78-11788

POLIOVIRUS REMOVAL FROM PRIMARY AND SECONDARY SEWAGE EFFLUENT BY SOIL FILTRATION,
Baylor Coll. of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
For primary bibliographic entry see Field 5D.
W78-11789

SEWERAGE STUDY HITS SOUTH TAHOE AWT COSTS.
For primary bibliographic entry see Field 5D.
W78-11791

MILWAUKEE'S LAST STAND - CITY FIGHTS ADVANCED TREATMENT ORDERED IN WATER CLEANUP SUIT.
Engineering News-Record, Vol. 200, No. 22, p 13, June, 1978.

Descriptors: *Judicial decisions, *Tertiary treatment, *Lake Michigan, *Sewerage, *Overflow, Legal aspects, Water quality standards, Michigan, Illinois, Wisconsin, Great lakes region, Construction costs, Financial, Waste water treatment, Municipal wastes.

The city of Milwaukee, Wisconsin, is fighting a federal decision on a suit brought against the city of Illinois and Michigan. The decision mandated that Milwaukee construct a tertiary treatment plant to accommodate all of its municipal wastes before discharge to Lake Michigan. Milwaukee contends that the construction costs would be excessive, $1.46 billion, and that the advanced treatment plant would require 11 yrs to complete. The city also claims that storm water tunnels and detention systems to reduce the 50 overflows in the lake occurring each year should have priority over the treatment system. Since Wisconsin water quality standards are lowr than those in Illinois and Michigan, Milwaukee maintains that advanced treatment of waste water is not required; the EPA will refuse funding of the advanced waste water system and will only supply grants for treatment witin Wisconsin's standards. An Illinois official has claimed that the costs reqported by Milwaukee for the tertiary treatment are inaccurate and excessive. The court decision required that the treatment faility be completed by 1986. (Lisk-FIRL)
W78-11792

HOLLAND FIGHTS WATER POLLUTION.
For primary bibliographic entry see Field 6E.
W78-11793

THE WRC-WHERE THEY KNOW A BIT ABOUT WATER AND ARE LEARNING ALL THE TIME.
Surveyor, Vol. 4487, No. 151, p 17-19, June, 1978.

Descriptors: *Research facilities, *Sewage sludge, *Dewatering, *Anaerobic digestion, *Filtration, Oxygenation, Aeration, Soil amendments, Activated sludge, Aquatic environment, Rainbow trout, Leakage, Waste water treatment, Municipal wastes.

Waste water treatment, transport, leakage, and impact research projects have been conducted by the Water Research Center at Stevenage, England. Tests on sewage sludge have concentrated on economical methods of disposal, agricultural benefits, metal extraction, and pumping of thickened sludge with 12% solids contents. Oxygen injection into activated sludge plants and rising main sewers has been practiced as an alternative to diffused air and surface aeration. Anaerobic digestion rather than aerobic treatment has been tested as source of methane production, as an economical means of treating warm waste water, and as a method which produces less sludge. Anaerobic filtration of acetic acid-bearing wasste water has been found to reduce organics by 90-97%. Urban runoff measurement and sampling has been conducted in on-site investigations. The sensitivity of fish to pollutants, odors, and reduced dissolved oxygen concentrations has been measured using rainbow trout. Leaks have been detected in water pipes and pressurized sewage conduits with a sulfur hexafluoride injection technique. When a leak is present, the sulfur hexafluoride gas permeates to the ground surface and collects in bar holes drilled above the pipes. (Lisk-FIRL)
W78-11795

REGIONAL WASTEWATER TREATMENT SYSTEMS IN JAPAN,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5D.
W78-11814

ORGANIC ASSIMILATION CAPACITY OF MAUMEE RIVER ESTUARY AT TOLEDO, OHIO,
Earthview, Inc., Toledo, OH.
G. R. Kunkle, and S. L. Wordelman.
Journal Water Pollution Control Federation, Vol. 50, No. 5, p 957-969, May, 1978. 11 fig, 4 tab, 13 ref.

Descriptors: *Waste assimilative capacity, Rivers, *Estuaries, *Self-purification, *Dissolved oxygen demand, Biochemical oxygen demand, Model studies, Stratification, Storm water, Analytical techniques, Pollutant identification, Waste water treatment, Municipal wastes.

The Storm Water Management Model (SWMM) and a streamwater quality budget model evaluated the organic waste assimilative capacity of the Maumee River estuary at Toledo, Ohio. A total annual BOD load of 5, 485, 900 kg, calculated by SWMM, flows into the Maumee River through combined and separated sewers, industrial discharges, the Bay View Water Reclamation plant, abnormal bypasses of overflows, and Swan Creek. A water quality monitoring station on the river has detected vertical stratification of dissolved oxygen during the summer months; the dssolved oxygen flowing load deficit between the months of June and October ranged over 3,000-9,300 kg/day. The streamwater budget model for determining the assimilative capacity of the river calculated the net and gross dissolved oxygen concentrations, the upstream and local BOD flushed, the benthic BOD deposited and exerted, the gross oxygen demand, and the changes in dissolved oxygen storage. The annual average dissolved oxygen supply of 33,200 kg/day and the gross oxygen demand of 33,100 kg/day represented a 100 kg/day dissolved oxygen storage change. The assimilative capacity of the Maumee River during the summer months varied over 7,800-27,100 kg/day, requiring an instream oxygen demand reduction ranging from 7,300-16,000 ky/day. It was concluded that if all local BOD discharges to the river were eliminated, the dissolved oxygen concentration would still be below 4.0-5.0 mg/liter dissolved oxygen standard set by Ohio. (Lisk-FIRL)
W78-11862

SIMULATION AND DESIGN OF PUMPED STORMWATER SYSTEMS,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-11878

EFFECT OF INTRAGRANULAR POROSITY OF COMPACTION,
Illinois Inst. of Tech. Chicago.
For primary bibliographic entry see Field 8E.
W78-11895

DEVICE FOR REGULATING DRINKING WATER,
Okazaki Mfg., Co. Ltd., Kawagoe (Japan).
For primary bibliographic entry see Field 5F.
W78-11939

WATER FILTRATION METHOD,
For primary bibliographic entry see Field 5D.
W78-11940

TREATMENT OF SULFIDE-BEARING WATERS WITH CHLORINE DIOXIDE,
Olin Corp., New Haven, CT. (Assignee).
For primary bibliographic entry see Field 5F.
W78-11941

COMPARISON OF THE RADIOACTIVE AND MODIFIED TECHNIQUES FOR MEASUREMENT OF STREAM REAERATION COEFFICIENTS,
Geological Survey, Bay St. Louis, MS. Water Resources Div. and Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-11977

GROUND-WATER STORAGE IN THE JOHNSON VALLEY AREA, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-11984

CULTURING AND ECOLOGY STUDIES OF THE ROTIFER POLYARTHRA VULGARIS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
A. L. Buikema, Jr., J. Cairns, Jr., P. C. Edmunds, and T. H. Krakauer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 587, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/3-77-051, August 1977. 51 p, 7 fig, 16 tab, 92 ref. R800815.

Descriptors: *Laboratory animals, *Polyarthra vulgaris, Ecology, *Rotifers, *Zooplankton, *Methodology, *Cultures, Water temperature, Survival, Reproduction, Egg production, Fish diets, Light, Vitamins, Food habits, Fertility, Food webs, Bioassay.

Factors affecting successful laboratory culturing of the rotifer Polyarthra vulgaris were investigated, and a field study was conducted of the relationship between P. vulgaris and 19 chemical and physical parameters. The rotifer has important applications as a laboratory food for yellow perch and bluegills, but has never previously been cultured itself in the laboratory. Specimens were collected from Pandapas Pond, near Blacksburg, Virginia, and from Carvins Cove Reservoir, near Roanoke, Virginia, and were cultured in natural filtered water in receptacles ranging from 0.5-mm depression slides to 5-liter containers. Conclusions were: (1) keep handling to a minimum; (2) use containers which hold at least one liter; (3) use natural water that contains P. vulgaris, filtered through a 30-micro mesh net; (4) replace medium partially twice a week and totally once a week; (5) optimum light is incident illumination or 400-500 ft-c, complete light spectrum, 16L 8D photoperiod; (6) maintain an oxygen concentration near 8 ppm; (7) minimum vitamins are B12, thiamine, Biotin, and pantothenic acid; (8) food can include a mixture of Chilomonas paramecium, Cyathomonas truncatus, Bodo minimus, B. variabilis, and B. mutabilis; (9) optimum temperature is 20C; (10) some bacteria, fungi, and algae were detrimental; and (11) minimum viable population density is 40 animals/liter. Information is given on population dynamics and fertility. (Lynch-Wisconsin)
W78-12008

PESTICIDE RUNOFF LOSSES FROM SMALL WATERSHEDS IN GREAT LAKES BASIN,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
For primary bibliographic entry see Field 5B.
W78-12009

ECONOMIC IMPACT OF PROPOSED AMENDMENT TO WATER POLLUTION REGULATIONS FOR HEXANE EXTRACTABLE MATERIALS, R74-1, 8, 9,
WAPORA, Inc., Charleston, IL.
L. W. Bates.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 184, Price codes: A09 in paper copy, A01 in microfiche. Illinois Institute of Environmental Quality Document Number 77/17, May 1977. 96 p, 2 fig, 17 tab, 53 ref, 5 append.

Descriptors: *Regulation, *Standards, *Effluent limitations, *Oil wastes, *Illinois, *Water pollution control, *Benefit-cost analysis, Waste water treatment, Industrial wastes, Economics, Costs, Effluents, Point pollution, Freon-extractable materials, Hexane-extractable materials.

The economic impact is assessed of altering the current Illinois legal limit of 15 mg/liter for total oil discharged from point sources by separately regulating polar and non-polar fractions of freon-extractable materials (FEM). The proposed standards are 15 mg/liter non-polar FEM and 15 mg/liter polar FEM. The proposition, R74-1, 8, 9, would amend Rule 408 of Chapter 3 of the Rules and Regulations of the Illinois Pollution Control Board. Three alternative scenarios were evaluated: (1) rejection of the proposed amendment and continuation of the current standard; (2) adoption of the proposed amendment and elimination of local ordinances limiting discharge of oils into sewage systems; (primary pretreatment and no biological overload of sewage systems are assumed) and (3) adoption of the proposed amendment, but with continuation of local ordinances limiting oils. No significant impact on employment, number of producers, prices, community expansion, or agriculture is likely under any of the scenarios. The incremental benefit-cost ratio would be highest in scenario number two; benefits in the form of operating and maintenance cost reductions are about five times the level of increased costs in the form of greater sewer-use expenditures and testing. Reduced costs in scenarios two and three probably would become profits rather than be passed on as lower prices. The profit increase is estimated at less than 5% for moderate to large firms, but profits of small firms could double. Damages for the three scenarios could not be qualified. (Lynch-Wisconsin)
W78-12010

EROSION OF SURFACE-MINE SPOILS,
Northeastern Forest Experiment Station, Berea, KY.
For primary bibliographic entry see Field 4D.
W78-12033

AQUATIC HABITAT OF COAL AND BENTONITE CLAY STRIP MINE PONDS IN THE NORTHERN GREAT PLAINS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
For primary bibliographic entry see Field 2H.
W78-12038

PROTECTION OF SURFACE WATERS AGAINST EXCESSIVE SALINITY BY MEANS OF SALINE WASTE-WATERS DISCHARGE CONTROL,
Institute for Meteorology and Water Management, Warsaw (Poland).
A. Polujkis, and M. Zajbert.
Journal of Hydrological Sciences, Vol 5, No 1, p 69-79, 1978. 3 fig, 8 ref.

Descriptors: Surface waters, *Salinity, Protection, *Optimization, *Discharge control, Saline water, Estimating, Hydrology, Design, Economic, Cost minimization, Social aspects, Equations, Systems analysis, Simulation analysis, Mathematical models.

Water resources mineralization development has been watched in Poland since 1950 through appropriate research works and studies on protection of waters against salinity. These studies, concerned mainly with chlorides and sulphates, made it possible to launch protection of the Vistula and Odra Rivers against excessive salinity. This paper deals with the estimation methods of condition and structure of salinity and with designing principles

and optimization methods for a protection system based on the discharge control (dosing) of saline waters in defined conditions of the hydrological regime of a waste-water receiver. Discussed first are: the harmfulness of water salinity for river biocoenosis and water management; and methods of surface water protection against salinity. Considered next is the optimal operation of dosing-retention reservoirs. Objectives include cost minimization and the maximization of system functioning effectiveness. It is concluded that the amount of costs is not the utlimate selection criterion; the optimum solution should consider several social factors, such as economic difficulties or sanitary accounts and natural aspects, e.g., the technical solution effect on biocoenotic changes in water. (Bell-Cornell)
W78-12040

STOCHASTIC PROGRAMMING MODEL FOR WATER QUALITY MANAGEMENT IN A RIVER,
Asian Inst. of Tech., Bangkok (Thailand).
For primary bibliographic entry see Field 5D.
W78-12041

HEALTH ASPECTS OF WATER REUSE IN CALIFORNIA,
California State Dept. of Health, Berkeley.
For primary bibliographic entry see Field 5F.
W78-12044

STORAGE-TREATMENT MIXES FOR STORM-WATER CONTROL,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W78-12046

OPTIMIZATION OF WASTE REMOVAL FOR WIDE SHALLOW RIVERS,
Drexel Univ., Philadelphia, PA. Dept. of Civil Engineering.
J. W. Eheart, E. F. Joeres, and J. A. Hoopes.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 104, No EE4, p 593-600, August 1978. 2 fig, 1 tab, 4 ref.

Descriptors: *Rivers, *Water pollution control, *Optimization, *Water quality, Constraints, Outfalls, Standards, Channels, Waste treatment, Linear programming, Dissolved oxygen, Biochemical oxygen demand, Planning, Waste disposal, Streeter-Phelps model, Cost minimization.

A two-dimensional water quality management model is presented for rivers where quality constraints are stated for only a portion of the channel cross section defined as a 'clearlane'. The model is applicable for discharges into rivers when dilution by lateral mixing and/or degradation by aerobic decay result in allowable concentrations over a portion of the channel. The problem is to determine the allocation of waste treatment investments that will offer the minimum costs, maximum equity to polluters, and maximum protection of the aquatic environment. The methodology utilizes linear programming and the Streeter Phelps model. Results are presented for an example involving five outfall discharges along a river with four different configurations of the physical situation comprising different channel shapes and mixing assumptions. The water quality strategies are shown to be dependent on the physical nature of the receiving river and the definition of the clearlane. (Bell-Cornell)
W78-12047

COMPARISON OF TANGIBLES AND INTANGIBLES,
Caldwell Connell Engineers, Melbourne (Australia).
I. G. Wallis.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 104, No EE4, p 625-637, August 1978. 2 fig, 2 tab, 17 ref, append.

Descriptors: *Water resources development, *Waste water(Pollution), *Preferences(Water rights), *Cost-benefit analysis, *Analytical techniques, Environmental engineering, Regions, Planning, Projects, Economic analysis, Game theory, Judgement, Water quality, Aesthetics.

Three techniques are described for comparing the tangible and intangible costs and benefits involved in wastewater management projects. The three methods are: (1) engineering judgement; (2) cost-benefit analyses; and (3) preference analysis. A game used in interviews to establish preferences is described and the interpretation of the results of the game is covered. It is concluded that each technique requires a degree of subjective judgement, but the development and cautious use of preference analysis as part of the evaluation of tangible and intangible costs and benefits is recommended. (Bell-Cornell)
W78-12048

ANIMAL WASTES AND NON-POINT POLLUTION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
E. C. Collins, Jr.
In: Non-point Sources of Water Pollution, Proceedings of a Southeastern Regional Conference, May 1-2, 1975, p 101-113. 2 fig, 5 tab, 7 ref.

Descriptors: Water pollution, *Non-point pollution, *Agricultural runoff, Pollutant sources, Economics, *Farm wastes, *Livestock wastes, *Poultry wastes, Land application.

The degree of control required for non-point pollution from animal wastes should be based on the relative importance of the various non-point sources in specific locations and on what is technically and logically controllable. In many cases it appears that it may be difficult to distinguish between pollution from farm animal wastes and natural, or 'background', levels of pollution. So, even if significant effort were expended to absolutely eliminate pollution from farm animal wastes, little or no change may be noted in stream quality. In many cases it can be argued as to whether or not all non-point sources can be controlled or eliminated. If collection and treatment is anticipated, it should be remembered that the costs associated with conventional waste-treatment systems are prohibitive, especially when compared with the economics of land disposal and nutrient utilization of animal wastes. (East Central Univ.)
W78-12053

ANIMAL WASTE MANAGEMENT AND OUR WATER QUALITY,
Purdue Univ., Lafayette, IN. Dept. of Animal Sciences.
A. L. Sutton.
Journal Paper No. 6508, Dept. of Animal Sciences, Purdue Agricultural Experiment Station, 1977, p. 81-90. 24 ref.

Descriptors: Water pollution, *Groundwater pollution, *Non-point pollution sources, *Feedlots, *Agricultural runoff, Leaching, Pasture, Management, Nutrients, Bacteria, *Farm wastes.

Research concerning the potential effect of livestock production as a non-point source of water pollution is discussed. Research results have been quite variable and sometimes conflicting. Livestock operations can contribute to non-point source water pollution by: runoff from manured land, leaching nutrients from manured land, leaching nutrients from earthen feedlots, and pasture management systems. Potential pollutants include nitrogen components, phosphorus, inorganic salts, solids, organic matter and certain bacterial organisms. Research has shown that applications of animal manure to frozen ground, to ground with vegetative cover or to rough plowed ground, in some cases, can affect the quality of surface runoff. Proper management practices and common sense can significantly reduce the threat of surface runoff contamination. If livestock manure is managed wisely with applications to cropped land at rates that the growing plants can utilize available nutrients, there will be minimal nutrient buildup and downward movement in the soil and minimum leaching into groundwater. Feedlot and soil type are important considerations in avoiding a possible leaching of nutrients into groundwater from earthen feedlots. Virtually no research has been conducted on the influence of pasture systems on non-point water pollution. Good management is the best insurance against pollution of water from pasture and range systems of livestock production. Very little research has been conducted in the Midwest under Indiana climate and soil conditions. (Merryman-East Central)
W78-12054

COST EFFICIENCIES OF LARGE-SCALE INTEGRATED DAIRY PRODUCTION AND WASTE MANAGEMENT SYSTEMS,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
S. C. Matulich, H. F. Carman, and H. O. Carter.
California Agriculture, Vol 32, No 3, p 8-10, March, 1978. 2 fig, 1 tab.

Descriptors: Regulation, Dairy industry, Model studies, Economics, Anaerobic digestion, Incineration, Washington, *Farm wastes, *Waste management, *Chino Basin(Wash), Composting, Refeeding

The impact of waste control regulations on the cost structure and future economic viability of dairies in the Chino Basin east of Los Angeles is discussed. Fourteen single-parlor dairies with capacities ranging from 375 to 1200 cows for two milking shifts were modeled. Short-run average costs were estimated for each of these model dairies. A combination of single-parlor dairies into multiple-parlor configurations yielded 15 more dairies in the 1200 to 3600 cow range. Four waste disposal treatment processes were analyzed as having 'good' volume reduction, stabilization, and resource recovery capabilities. Three of these - composting, anaerobic digestion, and refeeding - are biological processes; the fourth, incineration, is a physical/chemical process. Both semi-automated milking systems and group-feeding programs offer potential efficiencies for large-scale diaries. The dry lot/incineration system was the least-cost diary housing/waste diposal alternative considered. According to the analyis presented, enforcement of environmental quality controls need not raise the costs of dairy production in the long run. (Merryman-East Central)
W78-12055

FARMYARD MANURE AND CROP PRODUCTION IN DENMARK,
Askov Experimental Station (Denmark).
A. Dam Kofoed.
In: Utilization of Manure by Land Spreading, A Seminar in the EEC Programme of Co-ordination of Research on Effluents, organized by the 'Instituto Sperimentale Agronomico', Modena, Italy, Sept. 20-24, 1976, p 29-43. (1976) 3 fig, 8 tab, 2 ref.

Descriptors: Solid wastes, Liquid wastes, Confinement pens, Water pollution, Air pollution, Legal aspects, Economics, *Farm wastes, *Denmark, *Land application.

In Denmark for many years the use of 20-30 t/ha solid farmyard manure and 10-15 t/ha liquid manure on root crop fields every third and fourth year was a common practice. Manure was applied to crops which showed the greatest ability to utilize them and size of herds were based on the amount of food grown in the field. However, confinement feeding is becoming more predominant. Such feeding is accompanied by inherent problems. Concentrated animal production has left some farms completely without organic manure and others with a surplus. The handling of solid and liquid wastes from intensive animal production forms a considerable expense factor and with the possibility of making up for losses of nutrients from the field by application of commercial fertilizers, the farmer has less interest in careful storing of solid and liquid manure and thus there is a potential risk of pollution of surface waters. Buying feeds for confined animals released the livestock owners from dependence on the land for crop production. This means that in such a system of animal production the animal manure tends to be a waste product, difficult to dispose of in an economic way. A handling system for animal wastes which gives the best utilization of their plant nutrients at the same time may be the best security against a potential pollution of air and surface water. This means that animal manure must be incorporated into the soil soon after spreading and that it should be spread in limited amounts and in the right season for the crops which are utilizing the plant nutrients. With the increasing awareness of the public with regard to pollution of the environment from agricultural sources, Denmark must expect restrictions to be imposed which will protect that environment. (Merryman-East Central)
W78-12060

FUTURE DIRECTION OF WASTE UTILIZATION,
California Univ., Riverside.
P. F. Pratt, M. D. Thorne, and F. Wiersma.
In: Soils for Management of Organic Wastes and Waste Waters, Chapter 25, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Madison, Wisconsin, 1977, p 620-634. 6 ref.

Descriptors: Municipal wastes, *Farm wastes, *Recycling, *Groundwater recharge, Public health, Odor, Crop response, *Water pollution control, Pathogenic bacteria, *Land disposal, Refeeding, Groundwater pollution, Nutrients.

A report of the Council of Agricultural Science and Technology (CAST) dealing with use of sewage sludges and animal manures in agriculture summarized the problems that limit their use as follows: (1) Animal manures and sewage sludges are bulky low-grade fertilizers of variable composition. (2) These materials cannot be transported more than a few tens of miles before the costs of transportation exceed their fertilizer value. (3) Difficult on-farm management problems are created by their physical properties. (4) Animal manures and sewage sludges contain soluble salts that can limit their use in arid irrigated areas. (5) The undesirability of leaching of soluble salts may limit their use on some croplands. (6) Sewage sludges contain heavy metals that are retained in soils and might accumulate to the point where they are toxic to some plants. (7) Incompletely treated sewage sludges contain pathogenic bacteria, viruses, and parasites that represent a public health risk to farm workers and the public via the food chain. (8) Odors and associated nuisances create conflicts between urban and rural residents and the farmers of adjacent croplands where sludges and manures are used. (9) The use of sewage sludges on cropland is inhibited by sociological resistance. (10) Government agencies require monitoring of both crop and water quality if sewage sludges are to be used. (11) The practice of refeeding animal manures in inhibited by the concern for possible transmission of pathogens and undesirable organic residues into foods. (12) There are no meaningful guidelines, for using sewage sludges on cropland or manures as feed ingredients, that can be interpreted on a regional basis or in terms of local situations and needs. The CAST Report also outlined actions that can promote sewage sludge and animal manure use. Methods other than land spreading meriting consideration as a means of utilizing municipal and animal wastes include: use of animal manure as feed, use of animal manure for energy or fuel, use of effluents in ground-water recharge and use of sewage sludge as a source of metals. Trends for the use of animal wastes and municipal wastes are predicted. (Merryman-East Central)
W78-12061

PATHOGEN CONSIDERATIONS FOR LAND APPLICATION OF HUMAN AND DOMESTIC ANIMAL WASTES,
Agricultural Research Service, Beltsville, MD.
For primary bibliographic entry see Field 5E.
W78-12062

LAND UTILIZATION AND DISPOSAL OF ORGANIC WASTES IN ARID REGIONS,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 5E.
W78-12063

OPTIMIZATION OF RUNOFF DETENTION FOR NONPOINT POLLUTION CONTROL,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
L. B. Baldwin.
Paper No. 78-2049, Presented at American Society of Agricultural Engineers, 1978 Summer Meeting, Utah State University, June 27-30, 1978, 13 p. 1 fig, 3 tab, 7 ref.

Descriptors: *Nonpoint pollution sources, Model studies, Grazing, *Florida, Economics, *Runoff control, Wetland detention, Farm wastes, *Agricultural runoff.

Interest in the utilization of wetlands to capture nutrients in agricultural drainage has led to proposals that beef ranches on high water table soils in Florida preserve native wetland vegetation in lieu of planting improved pastures. While the effectiveness of wetland nutrient capture is not known, the economic impact of the proposed practice on ranching can be assessed. Linear programming has been used to optimize income under requirements for runoff detention. (East Central)
W78-12064

FEEDLOT POLLUTION CONTROL GUIDELINES,
Texas A and M Univ., College Station.
J. M. Sweeten.
Texas Agricultural Extension Service, Texas A&M University, 1974. 12 p, 4 fig.

Descriptors: *Feedlots, *Texas, *Regulation, Water pollution control, Air pollution, Management, Farm wastes.

The state and federal requirements for water pollution control and solid waste management for feedlot operations are discussed. Also presented are some guidelines to use in obtaining necessary permits for feedlot operation: (1) With engineering assistance, prepare preliminary plans for the feedlot and waste handling system. (2) Arrange an on-site meeting involving agency representatives, the engineer and the owner to decide what controls are needed. (3) Prepare final plans for the feedlot waste management system, incorporating decisions and agreements reached in step 1. (4) Submit application forms and documents to the regulatory agencies. (5) Publicize public hearings on each application as desired. (6) Attend public hearings, represented by attorney and engineer. (7) Accompanied by legal and technical representatives, attend state board meetings at which applications are considered for adoption. (8) Initiate construction in accordance with terms and conditions of permits. In general, feedlots with over 1000-head capacity must obtain permits prior to construction. Air pollution control guidelines are also enclosed. (Bates-East Central University)
W78-12065

SLURRY PROBLEMS IN RELATION TO POLLUTION OF SURFACE WATERS,
Queen's Univ., Belfast (Northern Ireland).
J. S. V. McAllister.
In: Semaine D-Etude Agriculture et Environnement, Copte-Rendu Des Seances, September 2-6, 1974. p 134-143, 5 tab, 11 ref.

Descriptors: *Slurries, Water pollution control, *Farm wastes, *Waste disposal, Waste management, *Land spreading, Literature reviews, Disease organisms.

The amount of slurry which can be safely spread on land depends on three factors: soil type, cropping system, and climate. A literature review is given concerning problems with land spreading of such wastes. Surface waters may be polluted when farm wastes such as slurry or silage effluent are able to gain rapid access to watercourses. Spreading wastes on land which is very wet, very dry with large cracks or which has porous backfill over field drains allows such rapid access to watercourses. Direct pollution of water may occur from silos of manure storage and housing areas when effluent passes through cracks or joints in well-made concrete structures and subsequently into drains. Waters may also be directly contaminated by disease organisms during the spreading of slurry either by direct runoff or by aerosol action. All farm effluents are rich in nutrients and have potential for causing eutrophication and secondary pollution. (Rowe-East Central)
W78-12067

DAIRY WASTE DISPOSAL,
P. Pattison.
Journal of Agriculture, Vol. 119, No. 6, p 32-33, 35, 1969. 3 fig.

Descriptors: *Dairy wastes, *Farm wastes, *Waste disposal, Water pollution control, *New Zealand.

The waste disposal system chosen by the individual farmer depends upon the amount and dilution of the waste, stocking rate, farm size, farm's soil characteristics and topography, the requirements of any permit issued to protect the receiving waters, the effectiveness of the present system, and the finance available. A New Zealand dairy wastes committee considers spray irrigation, under good management, to be generally the most effective and satisfactory means of disposal of dairy shed wastes. It may also be the most economical. Under some circumstances, salmonella has been found on pasture more than 60 days after spraying, however. The animal health division of the Department of Agriculture recommends that after spraying on pasture the maximum possible withholding period be observed before cows are again grazed, even under favorable conditions. Other systems in use include pumping with spreaders, ponding, and large sumps in conjunction with manure distribution and drains. Pumping with spreaders is less effective on wet soils and the thick layer of material associated with this method can possibly assist the spread of salmonella, leptospirosis, mastitis and other diseases of this nature. This method may also damage pasture and stimulate weed growth. Under some circumstances a well designed lagoon system can provide a satisfactory means of disposal, but it may be a costly choice in the long term. Disadvantages of a pond system are the possible pollution of groundwater and odor nuisance if the pond is not operat-

ing effectively. If the ponds are close to watercourses there could be pollution through seepage and, in some instances, fine particles of waste may eventually seal the soil and leave a sump type of ponding area which would eventually overflow, possibly creating a pollution problem. Use of large sumps in conjunction with manure distribution can enable a farmer to distribute waste on those areas that he considers will obtain the most benefit. A problem associated with this system is that in wet weather, it will probably be difficult to use wheeled vehicles because of the damage to roadways and pastures. A well designed and properly maintained sump system will cost almost as much as a spray disposal scheme to install and take more time to clean out. (Merryman-East Central)
W78-12068

PRELIMINARY IDENTIFICATION OF LITERATURE MODELS AND DATA FOR EVALUATING RURAL NONPOINT NUTRIENT, SEDIMENT, AND PATHOGEN SOURCES,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
J. A. Moore, C. A. Onstad, M. A. Otterby, H. L. Person, and D. B. Thompson.
University of Minnesota and ARS-USDA, North Central Soil Conservation Research Center, Morris, Minnesota, May, 1977. 223 p, 3 fig, 4 tab, 834 ref.

Descriptors: *Nonpoint pollution sources, Water pollution, *Minnesota, Nutrients, Sediment, Pathogenic bacteria, Farm wastes, *Model studies, Waste composition, *Agricultural runoff.

This report reviews the literature related to sources and transport of nutrients and sediment from agricultural lands and the literature related to survival and transport of pathogens from animal wastes; identifies and evaluates current predictor models as tools for assessing the effect of erosion and fertilizers on surface water quality in Minnesota; and identifies and assembles data sources anticipated to be necessary in evaluating the effects of animal waste, commercial fertilizers, soil losses and sedimentation upon surface water quality in Minnesota. (Merryman-East Central)
W78-12069

DISEASE HAZARD OF PATHOGENIC ORGANISMS IN FARM WASTE MATERIAL,
Agricultural Research Council, Compton (England). Inst. for Research on Animal Diseases.
D. A. Haig.
Journal of the Science of Food and Agriculture, Vol. 23, p 795, 1972.

Descriptors: *Farm wastes, *Pathogens, *Human diseases, Diseases, *Bacteria.

In order to make livestock waste management easier, many livestock owners have turned to handling the wastes in slurry form. Linked to slurry management is the danger that pathogenic organisms may be present. Preliminary experiments have revealed that while the pathogenic organisms examined did not appear to multiply in slurry held under static conditions, the organisms could persist for up to 12 weeks. Subsequently, it was found that under conditions of intense aeration the viability of salmonellas decreased more rapidly, presumably due to the rise in pH which accompanied aeration. Experiments have been done to examine the effects of applying salmonella contaminated slurry on pasture. Under the conditions of the tests, a strain of S dublin persisted for only 7 or 8 days on the higher levels of pasture but could persist for considerably longer periods (12 weeks) in the soil. The survival of the organisms was apparently dependent on such factors as grass cover, sunlight, temperature and rainfall. Calves allowed to graze pasture contaminated with slurry containing 10(6) organisms/ml became infected within a few days. When the rate of contamination was lowered to 10(3) ml, none became infected. In a subsequent trial calves were allowed to graze an acre of pasture which had been contaminated 1 week before with 10(5) salmonellas/ml. Continuous testing of the pasture was carried out. While organisms were present at grass levels below 1 in (25.4 mm) for at least one month, none could be detected in the upper portion of the grass and none of the animals became infected. (Merryman-East Central)
W78-12072

PRESENT SITUATION AND PROBLEMS ON ENVIRONMENTAL PROTECTION AND CONSOLIDATION IN JAPAN,
Tokyo Univ. of Agriculture and Technology (Japan). Chemistry Lab.
K. Ishimaru.
In: Symposium on Animal Research, Proceedings of a Symposium on Tropical Agriculture Researches, Oct. 1973. Tropical Agriculture Research Series No. 7, Tropical Agriculture Research Center, Ministry of Agriculture and Forestry, Tokyo, Japan, Aug 1974, p 147-162. (1974) 1 fig, 25 tab.

Descriptors: Odor, *Water pollution control, Physical treatment, Chemical treatment, Waste treatment, *Farm wastes, *Japan, Livestock wastes, Legal aspects, Physical properties, Chemical properties, Fertilizers, Land application.

In recent years, changes in the Japanese diet have resulted in an increased demand for meat products. Over the last ten years, the number of farms in Japan has decreased while numbrer of animals per farm has increased at an unprecedented pace. This intensification of meat production has resulted in vast accumulation of animal wastes which must be managed in compliance with the Basic Law Environmental Pollution Control of Japan. Animal wastes are involved in two categories: offensive odors and water pollution. The methods prescribed for controlling offensive odors are: (1) closure of barn, (2) dilution of odor, (3) masking, (4) rinse, (5) chemical treatment, (6) oxidation, (7) absorption, (8) thermal decomposition, (9) microorganism treatment-biological method, (10) soil treatment. In treating animal waste to prevent water pollution, several factors must be considered before a treatment plant is constructed. They are: (1) precautions in disposing of effluent, (2) sources of water for dilution, (3) type of surrounding area, (4) size of available land, (5) configuration of ground, (6) weather conditions, (7) cost of treatment plant and treatment itself, and (8) treatment methods (machine, electronics, microbiology and chemistry). In using these animal wastes as fertilizers, the following conditions should be considered: (1) size of farm, (2) quality and composition of soil, (3) kind of crops, (4) form and decay-rate of fertilizer, (5) collection and treatment, (6) transportation and distribution, and (7) environmental and sanitation problems. (Bates-East Central)
W78-12073

INTERRELATIONSHIPS BETWEEN ANIMALS AND ENVIRONMENT IN HIGH-INTENSITY LIVESTOCK PRODUCTION,
Eidgenoessische Technische Hoxhaxhulw, Zurich (Switzerland). Inst. of Animal Production.
F. L. Hays, and W. Bianca.
Agriculture and Environment, vol. 2, p 311-331, 1975. 2 fig, 71 ref.

Descriptors: Confinement pens, *Feedlots, *Farm wastes, Waste disposal, *Livestock wastes, Animal health, Metabolic wastes, Land application, Refeeding.

Various ways in which animals and environment influence each other under conditions of high intensity production are presented. In high-intensity production, large amounts of animal waste products are generated which pollute the environment and are harmful to animal health and production. Three cycles were determined for the animal/environment relationship. These were: (1) A primary cycle which covers metabolic waste products, particularly heat, water vapor, carbon dioxide, methane, feces, and urine, as well as the effects of these agents on the animals. These effects include: sweating, panting, hyperthermia, eye irritation, and respiratory tract irritation. (2) A secondary cycle comprised of those metabolic waste products which have been broken down and transformed from feces and urine, such as hydrogen sulfide and ammonia. These gases may cause inflammation of mucous membranes, pulmonary oedema, dyspnea, gastro-intestinal disturbances, haemorrhages and eventually depression of growth rate and milk yield. (3) A third cycle which covers the agents that have been eliminated from the indoor environment to the outdoor environment. These include chemicals from liquid maure and pathogenic microorganisms. These agents enter the groundwater, the soil, and the plants. They may return to the animals with the feed and drinking water with toxic effects. A reduction of such adverse effects of animal wastes products may be attempted by the following means: (1) by keeping an optimal balance between livestock and crop management, (2) by choosing optimal sizes of animal production units in relation to their mutual distances, and (3) by recycling, by using (suitably treated) manure as animal feed. (Merryman-East Central)
W78-12077

A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND -- PART I,
S. L. Willetts.
Environmental Pollution Management, Vol. 4, No. 6, p 265, 267, 271, 273, Nov./Dec. 1974.

Descriptors: *Model studies, Soil amendments, Fertilizers, Nitrogen, Slurries, Costs, *Farm wastes, *England, *Transport system(Water), Manure bank, Application rates.

The purpose was to examine the feasibility of a transport system in England that would relieve the overabundance of animal wastes and the pollution hazard associated with this excess in the West while at the same time improving the soil structure of the heavily fertilized East. The English county redistribution model was based on the successful operation of a similar system in the Netherlands in which the Dutch 'manure bank' takes manure from regions of overproduction at a nominal charge to the producer and then sells it to regions of poor soil structure. The English model classified counties, based on agricultural statistics, or either arable, grass or mixed. A low mileage network of transporting the maure was then worked out based on the maximum application of 50-60 units N/acre as manure or slurry on grassland counties; 40 units manurial N/acre for arable counties; and 40-50 units N/acre as manure for the mixed counties. This model provides for the prevention of pollution by maure from intensive animal production regions, plus it benefits the arable East which has almost reached the maximum N fertilization limits using inorganic fertilizers. (See also W78-12079) (Bates-East Central)
W78-12078

A MODEL FOR ALLEVIATING FARM WASTE POLLUTION IN ENGLAND -- PART 2,
S. L. Willetts.
Environmental Pollution Management, Vol. 5, No. 1, p 13-16, Jan/Feb, 1975. 3 tab, 8 ref.

Descriptors: Water pollution, *Waste treatment, Waste disposal, Drying, Slurries, Soil amendments, *England, Cattle wastes, Swine wastes, *Farm wastes, Poultry wastes, Refeeding.

The purpose was to demonstrate how the drying of wet manure from the western part of England may help in the solution of farm waste disposal problems. Several types of dryers were discussed:

mechanical dryers (presses and centrifuges), heat dryers, flash dryers, drum dryers, ring dryers, fluid bed dryers, attritor dryers, and microwave dryers. The cost of producing the dry product for each dryer, at optimum operation, will depend upon: (1) required final moisture content, (2) moisture content of input, (3) length of working day, (4) capital cost of the machine, (5) fuel costs during operation, (6) power requirements, (7) supervisory staff requirements. Poultry manure, after drying, would be the best source for possible uses as a product. Cow slurry, pig slurry, farmyard manure, and sewage sludge were also tested. DPW makes and excellent fertilizer and soil conditioner. As a protein source, DPW is comparable to cereals so it could be used as a feedstuff. These possible uses are not met with much enthusiasm at present. Also, the bulk of manure causing problems in waste disposal is the wet cow slurry in the western regions, and this is uneconomical to dry. However, DPW is a saleable product and would contribute to the alleviation of water pollution. (See also W78-12078) (Bates-East Central)
W78-12079

NITROGEN MOVEMENT NEAR SURFACE MANURE STORAGES,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
F. J. Sowden, and F. R. Hore.
Canadian Journal of Soil Science, Vol. 56, No. 3, p 223-231, Aug. 1976. 3 fig, 3 tab, 16 ref.

Descriptors: *Waste storage, Nutrients, *Nitrates, Ammonium, Phosphates, Leaching, Overflow, *Agricultural runoff, Groundwater pollution, *Nitrogen, Path of pollutants, *Farm wastes, Manure pit.

No evidence of serious groundwater contamination by excess nutrients from solid manure storage areas that had been used for over 30 yr at the Experimental Farm, Ottawa was found in an investigation that was carried out over a period of 4 yr. One storage area was on a concrete base and the other was located on a gravel base. The water table was usually above the 275-cm depth at both sites. Two unused shallow dug wells less than 250 m from the storage areas were not contaminated by nitrate, ammonium or phosphate. Water from piezometers installed at 275- and 425-cm depths near the gravel base storage area was always low in nitrate and ammonium, but sometimes appreciable levels of nitrate were found in water from a 122-cm deep piezometer. Water from piezometers installed at 122- and 275-cm depths near the concrete base storage area usually contained nitrate and ammonium. Water from piezometers installed 213 and 241 m from the storage areas in the direction of groundwater flow contained little nitrate or ammonium. The conditions prevailing in the area and the variation in the nitrate content of the groundwater during the seasons suggested that much of the nitrate originating from the storage area was denitrified at or near the water table. (East Central Univ)
W78-12080

AGRICULTURE'S ROLE IN ENVIRONMENTAL QUALITY,
Agricultural Research Service, Beltsville, MD. Agricultural Engineering Research Div.
R. G. Yeck.
Presented at Pur-O-Sphere Convention, Kiamesha Lake, New York, March 22, 1971, 10 p.

Descriptors: *Agriculture, *Feedlots, *Water pollution control, Air pollution, Odor, Toxicity, Cost sharing, Proteins, Algae, *Farm wastes, Waste management, Land disposal, Nitrates, Agricultural Stabilization and Conservation Service, Farmers Home Administration, Refeeding, Ensiling.

Feedlot production of animals has led to problems with waste management. Such wastes are causing air and water pollution problems. Animal wastes entering surface water supplies may decrease potability, may cause excess aquatic growth, and may destroy their recreational potential. The moving of city dwellers into areas containing feedlots has caused odor to become an eminent problem. Due to economic advantages of commercial fertilizers, land disposal no longer seems to be the answer to animal waste disposal. Also, there are many times of the year when land isn't available and the wastes must be stored. Stored wastes spread on lands often add to odor nuisances. Additionally, there is a limit to the loading rate. Grasses receiving too many nitrates can become toxic to grazing animals. Research has identified techniques that reduce the quantity of wastes that are eroded from feedlots. These include detention ponds and interception terraces. Action programs that have been initiated to implement research findings include cost sharing programs by the Agricultural Stabilization and Conservation Service, technical and advisory assistance from the Soil Conservation Service, educational programs by the extension service, and some loans by the Farmers Home Administration. Alternative for animal waste disposal that are under study include: (1) processing of animal wastes by heat treating or ensiling and then refeeding them to animals and (2) biological separation of protein from wastes with insects and reclaiming nutrients through harvest of algae. (Merryman-East Central)
W78-12081

WATER QUALITY AND THE FARM POND,
Department of Agriculture, Lethbridge (Alberta).
J. R. Allan.
Canada Agriculture, Vol. 22, No. 2, p 3-4, Spring, 1977. 2 fig.

Descriptors: *Farm ponds, Water quality, *Agricultural runoff, *Feedlots, Water pollution control, Farm wastes, Non-point pollution sources.

With growing urban populations, there is pressure on agriculture to produce more food on less land. Marginal land that once acted as a buffer between cultivated land and aquatic environments is often now cultivated. Thus, the lakes, ponds and canal systems can now receive increased amounts of nutrients from the drainage of fertilized upland, grazed grassland, the farmyard, feedlot waste drainage and livestock watering. This in turn stimulates excessive aquatic vegetation and deteriorates the quality of water. Control of this depends on managing the level of nutrients reaching the farm pond. This can be done by constructing pond and drainage canals according to guidelines set out by the Prairie Farm Rehabilitation Administration. These include a shelterbelt or tree line with the area between it and the pond being grassed. This helps contribute to the water supply, acts as a biological filter to retain the excess nutrients and prevents soil erosion. The pond or canal must be fenced to keep livestock out. This prevents bank destruction, soil erosion, and phosphorus and nitrogen enrichment of the water by animal wastes. If the pond is kept clean, it can be stocked with fish, or used for irrigation, swimming, and general farm use. It is very critical that terrestrial weed seeds from plants growing on the canal banks are prevented from entering the water and being spread on fields during irrigation. (Bates-East Central)
W78-12082

CONCEPTUAL MODELLING OF NONPOINT SOURCE POLLUTION FROM LAND AREAS RECEIVING ANIMAL WASTES: I. NITROGEN TRANSFORMATIONS,
North Carolina State Univ. at Raleigh.
For primary bibliographic entry see Field 5B.
W78-12083

WHAT TO DO WITH ANIMAL WASTES ... RECYCLING,
Michigan State Univ., East Lansing.
R. L. Maddex.
Electricity on the Farm, Vol. 44, No. 7, p 6-9, July, 1971. 1 fig.

Descriptors: *Waste disposal, Water pollution, Odor, Air pollution, Aesthetics, *Land disposal, Drying, Separation techniques, Waste storage, Lagoons, Aerobic conditions, Anaerobic conditions, *Farm wastes, Ponds, Stacking.

Livestock wastes contribute to or cause the three following types of pollution: (1) contamination of surface and ground water, (2) odor and/or air pollution, and (3) visual unsightliness. The general methods of waste disposal are: (1) surface, and (2) bacterial decomposition. Perhaps the best solution presently available is a combination of bacterial decomposition and surface disposal that will provide good control of pollution to surface and groundwater, eliminate or minimize odors, and avoid the visible appearance of polluted land. Other methods of waste handling such as drying, separation of the solids by screens, or plowing down waste as it is distributed are really methods of processing which, at present, are not economically practical for the vast majority of livestock operations. Each method of manure handling has some characteristics that identify its benefits or limitations for an individual farm operation. The major characteristics are: (1) daily manure distribution, (2) farmstead storage -- periodic distributions: (a) liquid manure storage, (b) stacking, (3) ponds or lagoons: (a) aerobic, (b) anaerobic. Two variations of the ponding or lagooning method that combat odor problems and/or reduce structure size are: (1) anaerobic lagoons with mechanical aerators, (2) retention basin (pond) plus lagoon. (Merryman-East Central)
W78-12085

PREVENTING POLLUTION WHILE EXPANDING THE LIVESTOCK INDUSTRY IN SOUTH DAKOTA,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
J. N. Dornbush, and J. M. Madden.
In: Symposium Proceedings: South Dakota's Environment - Its Pollution and Preservation, South Dakota State University, April 13, 1971, p 15-19. (1971) 4 fig, 3 tab.

Descriptors: *Feedlots, *South Dakota, *Livestock, *Water pollution control, Management, Cost sharing, Regulation, Agricultural runoff, Climate, Diversion, *Farm wastes, Terraces, Debris basins, Detention ponds.

A great deal has been learned in the past several years concerning the magnitude and control of pollution from feedlots. It appears that the overall pollution problem from livestock feeding operations may not be as critical in South Dakota as has been assumed in other areas. Climatic factors appear favorable; nevertheless, feedlots poorly located with excessive drainage may be expected to cause serious pollution, especially to lakes. Information and assistance is available to plan the construction of practical, economical pollution control facilities, and cost-sharing for the construction is available. There now appears to be little excuse for delaying a program to prevent pollution with all planned construction for expansion of the feeding industry. (East Central Univ)
W78-12087

USE OF FLUID COWSHED MANURE IN FISH PONDS,
Agriculture Research Organization, Dor (Israel). Fish and Aquaculture Station.
For primary bibliographic entry see Field 5E.
W78-12088

NONPOINT POLLUTION CONTROL FOR WINTERING RANGE CATTLE,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.

J. E. Dixon, G. R. Stephenson, A. J. Lingg, D. V. Naylor, and D. D. Hinman.
Paper No. 77-4049, Presented at American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 31 p, 4 tab, 49 ref.

Descriptors: Cattle, Water pollution, Nutrients, Microorganisms, Agricultural runoff, *Farm wastes, *Nonpoint pollution sources, Barnlot-pasture operations, Range operations.

Cow-calf operations might be classified as: (1) a barnlot-pasture operation, and (2) a range operation often involving confined wintering. Public Law 92-500 addresses control of pollution with special emphasis for nonpoint source control beginning in 1977. The cow-calf operation as a whole and the wintering operation, particularly the range-type, fits the definition of a nonpoint source. Data available indicate the range-type of confined wintering most probably will contribute little to the nutrient and chemical load of a stream, but could contribute to microorganism contamination of the stream. The barnlot-pasture operation would contribute all three types of pollutants to a stream. Microorganisms as a pollutant from range-type wintering operations might be overemphasized because they may be the only discernable pollutant. Their direct effect on individual people can be quite severe, and there is a potential latent effect because, under some conditions, the microorganisms have an extended life in manure. There seems to be no data from which to directly prepare guidelines for management of cattle wintering operations to minimize nonpoint pollution. Using related data, it seems a prime management factor would be to minimize erosion and sediment load which would also lower nutrient losses. Based on data from feedlots, it might be expected that the characteristics of the hydrological event will influence the loss of pollutants to a greater extent than the slope of the land or the density of cattle. Winter conditions involving snowfall and thawing will most likely add more to the pollution load of streams from cattle winter operations than rainfall and summer-like conditions. When evaluating a cattle wintering operation as a potential nonpoint source, the background or 'natural' pollution load should be considered. Furthermore, the evaluation of data from samples of runoff should consider the location of the sampling point in relation to the source, the dilution of pollutants, and the sampling time in relation to the hydrograph. Space allocation of cattle in wintering can range from 0.15 to 51 square meters/kilogram of live animal weight. A realistic range of values for the dry manure defecated upon these wintering areas might be 0.36 to 123 metric tons/hectare. The concentration and quantity of pollutants from cattle wintering areas is not known. (East Central Univ)
W78-12089

ENVIRONMENTAL IMPACT OF BEEF CATTLE ON FLATWOODS SOILS,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
K. L. Campbell, D. A. Graetz, and R. A. Nordstedt.
Paper No. 77-4048, Presented at American Society of Agricultural Engineers, 1977 Annual Meeting, North Carolina State University, June 26-29, 1977, 14 p. 4 fig, 1 tab, 4 ref.

Descriptors: Cattle, Management, Confinement pens, Lagoons, *Agricultural runoff, *Soil water movement, Groundwater pollution, Chemical properties, *Farm wastes, *Environmental effects, Pasture, Semi-confinement, *Flatwood soils.

The overall environmental impact of more intensified animal production techniques must be examined. In this study, beef cows and their calves were produced at the following stocking rates: (1) pasture (5400 m2 per cow-calf unit), (2) semi-confinement (680 m2 per cow-calf unit), and (3) confinement (18.6 m2 per cow-calf unit). A natural forest area was included in the study for comparison with the other systems. All three production systems, as well as the forest area, were on sandy, high-water-table flatwoods soils. Cattle in the confinement system were on concrete while the others were on bahiagrass - white clover pasture. Wastes from the confinement system were handled by a combination retention basin - lagoon. Runoff from the other systems was through natural drainage-ways. Water quality measurements included chemical oxygen demand, pH, specific conductivity, and forms of nitrogen and phosphorus. Hydrologic measurements included precipitation, evaporation, surface runoff, water table levels, and lateral groundwater movement around the lagoon. Water quality was measured in surface runoff, soil solution, and groundwater. Losses of nutrients in surface runoff were minimal throughout the two-year period due partially to low rainfall. Nutrient concentrations in runoff also were relatively low. Soil solution and groundwater quality were very similar in the pasture and forest areas. Soil solution and groundwater quality also were very similar in the semi-confinement area except for a nitrate buildup in the top 1.2 m. No significant water quality changes were observed in the confinement area during the study. No serious water quality impacts are apparent from this study; however, the semi-confinement area especially needs further study under more normal precipitation conditions to determine if water quality problems are likely to occur. (East Central Univ)
W78-12090

ENVIRONMENTAL PROTECTION AGENCY VS. ROBERT R. DETERS; FABIAN J. DETERS; MARCELLUS J. DETERS; ALVIN L. DETERS; WILLIAM H. DETERS, JR.; AND NORMA MARIE DETERS WEIMAN.
PCB 72-260, Illinois Pollution Control Board, Nov. 8, 1972, 3 p.

Descriptors: Water pollution, *Regulation, *Illinois, Odor, Turbidity, *Farm wastes, Legal aspects, Dairy wastes, Cattle wastes, Feedlot runoff, Environmental Protection Act, Illinois Pollution Control Board.

The Environmental Protection Agency (EPA) filed a complaint against Robert R. Deters, Fabian J. Deters, Marcellus J. Deters, Alvin L. Deters, William H. Deters, Jr., and Norma Marie Deters Weiman, with the Illinois Pollution Control Board. The EPA alleged that the Deters operated their dairy farm in such manner as to cause the discharge of dairy product wastes and cattle lot runoff into a roadside ditch to an unnamed tributary of Curtis Creek so as to cause water pollution, in violation of Section 12(a) of the Environmental Protection Act and also to cause odor and turbidity to such a degree as to create a nuisance, in violation of Rule 1.03 (c) of the Illinois Sanitary Water Board Rules and Regulations SWB-14 and also Rule 203 (a) of the Illinois Water Pollution Regulations (adopted March 7, 1972). Hearing was held on September 20, 1972 at which time the parties filed a Stipulation of Facts wherein the respondents admitted to the allegations in the complaint. It was ordered that the respondents shall cease and desist from all violations found in the Illinois Pollution Control Board Opinion after January 22, 1973. It was ordered that the respondents pay to the State of Illinois by December 15, 1972 the sum of $5,000 as a penalty for the violations found in the proceeding. (Bates-East Central)
W78-12091

CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 5E.
W78-12092

POULTRY WASTE MANAGEMENT ALTERNATIVES: A DESIGN AND APPLICATION MANUAL,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
J. H. Martin, and R. C. Loehr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 176, Price codes: A10 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-77-204, Oct. 1977, 202 p, 72 fig, 39 tab, 18 ref.

Descriptors: *Poultry wastes, Waste management, Design, Economics, Fertilizers, *Farm wastes, High-rise, Undercage drying, Oxidation ditch, Odor control, Biological oxidation, Waste stabilization, Refeeding.

Changes in the egg production industry during the past 20-30 years have produced waste management problems which threaten both water and air quality. Results from a number of research studies have identified two processes -- aerobic biological stabilization and drying -- that provide both odor control and the reduction of the water pollution potential of these wastes. In this manual, the theoretical concepts underlying each poultry waste management approach are discussed, and process design methodologies are presented. Included are design examples to illustrate the application of design methodologies. A discussion of the impact of design decisions on performance characteristics and computer programs to assist in the process design for each alternative are also presented. Both high-rise, undercage drying and aeration systems are compared to identify relative merits and provide economic projections. Odor control and plant nutrient conservation capabilities as well as refeeding potential for both alternatives are discussed. (East Central)
W78-12093

FEEDLOT RUNOFF CONTROL FROM POINT/NON-POINT SOURCES.
American National Cattlemen's Association.
American National Cattlemen's Association, Special Report, 1975, 24 p. 2 fig.

Descriptors: Legal aspects, *Agricultural runoff, *Non-point pollution sources, Water pollution, Model studies, Economics, NPDES, *Feedlot runoff, Runoff control.

The National Cattlemen's Association appointed a special committee to evaluate the point/non-point sources National Pollutant Discharge Elimination System (NPDES) exemption-court order. Information presented includes: (1) Definition of 'Concentrated Animal Feeding Operations', (2) Comments on Hydrologic Model to Predict Quantity and Quality of Feedlot Runoff, (3) Economic Impact of BPT and BAT vs. Size, (4) Recommendations on Effluent Limitations, (5) Recommendations for Land Application of Manure, and (6) Administrative Devices. (Merryman-East Central)
W78-12097

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

INTERNATIONAL SYMPOSIUM ON RISK AND RELIABILITY IN WATER RESOURCES.
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
Proceedings, Volume II, June 26-28, 1978, University of Waterloo, Ontario, Canada, 1978. 470 p, 128 fig, 49 tab, 366 ref. McBean, E. A., Hipel, K. W., and Unny, T. E., Eds.

Descriptors: *Risks, *Reliability, Water resources, *Analytical techniques, *Stochastic

processes, *Streamflow, *Hydraulic structures, *Decision making, *Reservoir operation, *Hydrology, Failure(Mechanical), Probability, Simulation analysis, Optimization, Statistical methods, Bayesian analysis, Planning, Management, Methodology, Mathematical models, Systems analysis, Equations, Uncertainty.

The papers presented at this Symposium emphasize the application of systems analysis techniques to the problems of risk and reliability in water resources operations, planning, and management. Volume II contains those articles concerned with: stochastic modeling of flows; the failure of hydraulic structures; decision theory analyses; uncertainties in low and high flow estimates; extreme events; and finally reservoir management. Numerous analytical techniques for dealing with problems of probability--simulation analyses, statistical methods, Bayesian analyses, optimization techniques, graphical methods, and Markov processes--are presented by many authors from Canada and the United States, a number from England and West Germany, and a few from other European countries, South America, and the Far East. Many of the articles present highly detailed illustrations. (See W78-10094 and W78-11387 thru W78-11419) (Bell-Cornell)
W78-11386

BIVARIATE PDF FOR FLOOD RISK EVALUATION IN CASE OF UNSTEADY FLOW,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
S. Bruk, and S. Prohaska.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 471-479, 1978. 5 fig, 1 ref.

Descriptors: *Risks, *Floods, *Evaluation, *Unsteady flow, Hydrographs, River systems, Flood damage, Hydrologic data, Computer programs, Flood protection, Probability, Flood peak, Flood volume, Sava River(Yugoslavia), Cost-benefit analysis, Systems analysis.

The modern concept of adjustment to flood hazards instead of classical flood control emphasizes the need for an adequate definition of the level of flood protection, based on a realistic evaluation of the flood risk. The widely-used practice of defining floods by a single parameter--the peak discharge--and evaluating the flood risk through its probability or return period tends to cause an oversizing of the flood protection structures. This may lead to wrong decisions at the planning stage, because of the distortion of the cost-benefit analysis. An improvement of flood risk evaluation can be achieved by defining the floods by two parameters: the peak flood and the flood volume. A bivariate PDF can be used to determine the probability of the flood event. A calculation method is briefly outlined using the log-normal PDF for that purpose. Further research is needed to examine the sensitivity of the method and to estimate the limits of confidence. (See also W78-11386) (Bell-Cornell)
W78-11387

TAIL BEHAVIOUR OF RIVERFLOW PROBABILITY DENSITIES,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-11388

THEORETICAL MODELS OF HYDROLOGIC PARAMETERS USING DERIVED DISTRIBUTION TECHNIQUES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-11389

IMPACT OF EXTREMAL DISTRIBUTIONS ON ANALYSIS OF MAXIMUM LOADING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-11392

ALLOWANCE FOR RISK AND UNCERTAINTY IN THE OPTIMAL DESIGN OF HYDRAULIC STRUCTURES,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-11393

LANDSLIDE POTENTIAL AND PROBABILITY CONSIDERING RANDOMNESS OF CONTROLLING FACTORS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W78-11394

DETERMINATION OF HYDRAULIC RESISTANCE FOR A DAM-BREAK WAVE BY COMPARISON OF THEORY AND EXPERIMENTS,
Technische Univ., Munich (West Germany). Inst. of Hydraulics and Hydrology.
For primary bibliographic entry see Field 8B.
W78-11395

HYDROLOGIC AND GEOMORPHIC CHANGES IN A RIVER BASIN INDUCED BY A DAM BREAK,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-11396

SHOULD WE TRY TO MEASURE RISK OR SHOUL WE ASSESS IT IN SOME OTHER WAY,
Waterloo Univ. (Ontario). Dept. of Statistics.
G. A. Barnard.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 629-637, 1978. 1 ref, append.

Descriptors: *Risks, *Statistical methods, *Probability, Forecasting, Decision making, Equations, Bayesian methods, Management, Assessment, Climatological data, Systems analysis.

Considered are problems arising from recent developments in statistical forecasting and decision methodology. DeFinetti's analysis of the concept of personal probability is discussed alongside other mathematical approaches. A warning is given against the uncritical adoption of 'Bayesian' methods of assessing risk in so far as they may lead us into the fatal mistake of neglecting the importance of collecting more climatological data. (See also W78-11386) (Bell-Cornell)
W78-11397

UNCERTAINTIES IN LAKE MANAGEMENT,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
L. Duckstein, and I. Bogardi.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 638-661, 1978. 4 fig, 3 tab, 51 ref.

Descriptors: *Decision making, *Lakes, *Management, *Uncertainties, Water levels, Water quality control, Eutrophication, Statistical methods, Equations, Systems analysis, Mathematical models, Bayes approach, Markov matrix, Probability density functions, Lake Balaton(Hungary), Water lease.

The various uncertainties faced in the management of large lakes are classified within the framework of a discrete-time system model. Two illustrative problems are considered: (1) the trade-off between maintaining a high water level to satisfy social requirements and a low water level to minimize possible damage by wind-induced waves; and (2) control of nutrient input into a lake to avoid eutrophication. Lake Balaton, Hungary is used as the illustrative example. The types of uncertainty considered in detail encompass natural, model, and informational. Natural uncertainty consists in hydrologic input (wind, rainfall, etc.) or nutrient input. Natural uncertainty is encoded in the form of probability density functions (pdf) of random variables describing hydrologic events. Model uncertainty consists, for example in the choice of pdf describing the occurrence of natural events or in the choice of empirical model to describe sediment yield. Informational uncertainty comprises two aspects: sample or parameter uncertainty, and economic uncertainty. Sample uncertainty originates from our uncertain knowledge of the parameters of pdf describing natural processes, especially pronounced in the case of bivariate processes. A Bayes approach makes it possible to derive an optimum decision under sample uncertainty and to calculate the expected value of perfect information and the worth of sample information. Another case of very high sample uncertainty is found in lake level control, for which a transition matrix of monthly inflows must be estimated from very sparse data. Sensitivity of the decision to estimates of this Markov matrix is investigated, and other types of uncertainties are briefly discussed. (See also W78-11386) (Bell-Cornell)
W78-11398

APPLYING DECISION THEORY TO FISHERY MANAGEMENT PROBLEMS,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
S. O. Russel.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 662-673, 1978. 6 fig, 15 ref.

Descriptors: *Decision making, *Fisheries, *Management, *Probability, Assessment, Effects, Pollution, Flood control, Salmon, Real time, Bayesian analysis, Mathematical models, Systems analysis.

Decision theory provides a framework for analysis and a set of concepts which would seem to be applicable to many resource management problems. But real problems are nearly always complex and it is difficult to capture the essence of the problem without becoming submerged in detail. This paper summarizes several studies of the application of decision theory to problems associated with fishery management problems in British Columbia. The approach taken was to try to model the decision process however roughly, and then to progressively refine the model (in other words, to start with a simple model and add complexity only as required). The first stage simple models are presented and subsequent steps are discussed. Examples include decision making on the target escapement for which to aim with a particular salmon run in a particular year--a simple Bayesian analysis--and a procedure for obtaining and combining subjective estimates of probabilities--an essential step in a formal analysis of many resource management decision problems. The decision model involves using as input a utility curve for the catch in the current year, a probabilistic relationship between the target escapement and the number of returning adults in the cycle year and a forecast of the size of the run in the current year, as well as computing the escapement with the

maximum expected utility which should be the target. (See also W78-11386) (Bell-Cornell)
W78-11399

SIMPLIFICATION OF ANALYSES UNDER UNCERTAINTY-WHEN TO IGNORE UNCERTAINTIES AND EXTREME VALUES,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
P. H. Byer.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 675-696, 1978. 4 fig, 3 tab, 9 ref.

Descriptors: *Decision making, *Water resources, *Screening models, *Uncertainty, *Extreme values, Planning, Evaluation, Effects, Multiple-purpose reservoirs, Dams, Probability, Equations, Mathematical models, Systems analysis, Certainty.

Uncertainty is pervasive in water resources planning. Consideration of the uncertainties and extreme values of an attribute makes the evaluation of alternative plans more realistic through also more complicated. The need and basis for deciding which uncertainties and extreme values to explicitly consider in an evaluation are discussed. A model for screening uncertainties is presented. It is based upon calculating, using decision analysis concepts and first-order estimates of utilities and probabilities, an estimate of the upper bound on the expected effect on the results of an evaluation of assuming certainty, rather than uncertainty, about the levels of an attribute. An application of the model to the problem of planning a hypothetical multipurpose dam and reservoir system illustrates its practicality and usefulness. Similar decision analysis concepts are used to discuss the basis for screening the extreme values of an attribute from an evaluation. It is shown that both the probabilities and the utilities of extreme values should be considered when screening them. (See also W78-11386) (Bell-Cornell)
W78-11400

STOCHASTIC MODEL OF A FLOOD FORECAST-RESPONSE PROCESS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4A.
W78-11401

POSTERIOR DISTRIBUTION OF THE PARAMETERS OF THE PEARSON TYPE III DISTRIBUTION; AN APPLICATION TO DESIGN FLOOD SERIES ANALYSIS,
Chile Univ., Santiago.
For primary bibliographic entry see Field 2E.
W78-11402

THE RELIABILITY OF LOW FLOW REGIONAL EQUATIONS IN BRITISH COLUMBIA,
Water Survey of Canada, Vancouver (British Columbia). Planning and Studies Section.
For primary bibliographic entry see Field 2E.
W78-11403

WET AND DRY PERIODS IN REGIONAL WATER EXCHANGE,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulic and Water Power.
Z. Sen.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 748-761, 1978. 1 fig, 16 ref.

Descriptors: *Wet seasons, *Dry seasons, *Regions, *Water exchange, Hydrologic aspects, Assessment, Droughts, Analytical techniques, Risks, Equations, Systems analysis, Theory or runs, Multivariate runs.

An effective assessment of water potential and related human activities of a region can be achieved on the basis of hydrologic, meteorologic, geologic, topographic, and socio-economic characteristics of that particular region. However, this paper specifically aims to investigate hydrologic variables with an emphasis on regional drought and consequently water exchange possibilities. In drought alleviation, there exist two major controls: namely, storage of water during wet periods in reservoirs and regional water exchange among various water resources, if possible. Herein, simple analytical expressions of joint properties of droughts at two or more sites are derived and their use in a regional water exchange scheme is discussed. The basis of the analytical procedure is the theory of runs which exploits not only the serial but also mutual properties of hydrologic sequences at distinct sites. Finally, general risk expressions of regional drought of a given duration are derived and tables for simple risk calculations are provided. In addition, a procedure is given which is useful to decide whether or not distinct but concurrent sequences are serially as well as mutually independent. (See also W78-11386) (Bell-Cornell)
W78-11404

STOCHASTIC MODELS OF EXTREME FLOWS AND THEIR APPLICATION TO DESIGN,
Montreal Univ. (Quebec). Ecole Polytechnique.
For primary bibliographic entry see Field 2E.
W78-11405

THE DISTRIBUTION OF THE EXTREME OF A MIXTURE RANDOM VARIABLE WITH APPLICATIONS IN HYDROLOGY,
Utah State Univ., Logan. Dept. of Applied Statistics and Computer Science.
For primary bibliographic entry see Field 2E.
W78-11406

ANALYSIS OF EXTREME EVENTS IN STATIONARY DEPENDENT SERIES,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 2E.
W78-11407

A NONPARAMETRIC APPROACH TO THE ANALYSIS OF EXTREME HYDROLOGIC EVENTS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-11408

A NON-GAUSSIAN STOCHASTIC MODEL FOR DESIGN-EXTREMES OF WATER RESOURCES SYSTEMS,
Technical Univ. of Lisbon (Portugal).
For primary bibliographic entry see Field 2E.
W78-11409

ON THE PREDICTION OF EXTREME FLOWS,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-11410

INCORPORATION OF FORECASTED TOTAL SEASONAL RUNOFF VOLUMES INTO RESERVOIR MANAGEMENT STRATEGIES,
Hokkaido Univ., Sapporo (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-11411

OPTIMAL DESIGN OF RESERVOIRS IN HYDROPOWER SYSTEMS WITH EXPLICIT CONSIDERATION OF RISK,
Technical Univ. of Istanbul (Turkey). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-11412

DIRECTIONS OF SECURITY FOR THE OPERATION OF A HYDROELECTRIC POWER STATION WITH NON STEADY FLOW, (ARTICLE IN FRENCH),
Quebec Dept. of Natural Resources Water General Management.
For primary bibliographic entry see Field 8C.
W78-11413

DESCRIPTIVE PROPERTIES OF HYDROLOGY MODELS FOR THE EXPLICIT STOCHASTIC OPTIMIZATION OF MULTI-RESERVOIR OPERATIONS,
Alcan Smelters and Chemical Ltd., Montreal (Quebec).
For primary bibliographic entry see Field 4A.
W78-11414

THE RELIABILITY OF SAND DEWATERING BEDS FOR SLUDGE MEASURED BY THE PERFORMANCE INDEX,
Clark (Edward E.), Miami, FL.
For primary bibliographic entry see Field 5D.
W78-11415

APPLICATION OF FEATURE PREDICTION MODEL IN HYDROLOGIC TIME SERIES SYNTHESIS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-11416

A SYSTEMS APPROACH TO RISK ANALYSIS FOR AN EARTH DAM,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 8D.
W78-11417

INCREASED RELIABILITY OF LOW WATER ANALYSES THROUGH SIMULATION OF TIME SERIES,
Coblenz Federal Inst. of Hydrology (West Germany).
For primary bibliographic entry see Field 2E.
W78-11418

CRITICAL DROUGHT REVISITED,
University of Western Ontario, London. Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W78-11419

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE. SPECIAL REPORT II: A NON-LINEAR PROGRAMMING MODEL FOR EVALUATING WATER SUPPLY POLICIES IN THE TEXAS COASTAL ZONE,
Texas Univ. at Austin. Div. of Natural Resources and Environment.
For primary bibliographic entry see Field 5G.
W78-11454

A PARAMETRIC STUDY OF THE VALUE OF HYDROLOGICAL INFORMATION FOR IR-

RIGATION AND HYDROPOWER MANAGEMENT OF THE FEATHER RIVER,
Econ, Inc., Princeton, NJ.
For primary bibliographic entry see Field 4A.
W78-11456

NONCONVEXITY AND OPTIMAL EXHAUSTION OF RENEWABLE RESOURCES,
For primary bibliographic entry see Field 6C.
W78-11498

BALANCING ECOLOMIC AND ENVIRONMENTAL OBJECTIVES,
Georgia Univ., Athens. Inst. of Natural Resources.
For primary bibliographic entry see Field 6B.
W78-11500

OPTIMAL DESIGN OF REGIONAL WASTEWATER SYSTEMS: A FIXED-CHARGE NETWORK FLOW MODEL,
Georgia Inst. of Tech., Atlanta.
For primary bibliographic entry see Field 5D.
W78-12043

COMPARISON OF TANGIBLES AND INTANGIBLES,
Caldwell Connell Engineers, Melbourne (Australia).
For primary bibliographic entry see Field 5G.
W78-12048

NONCOMPUTER OPTIMIZATION OF SINGLE-SOURCE NETWORKS,
Visvesvaraya Region Coll. of Engineering, Nagpur (India).
For primary bibliographic entry see Field 4A.
W78-12050

6B. Evaluation Process

GENERAL PLAN IMPLEMENTATION: THE GROWTH-PHASING PROGRAM OF SACRAMENTO COUNTY,
California Univ., Davis. Inst. of Governmental Affairs; and California Univ., Davis. Inst. of Ecology.
R. A. Johnston, S. I. Schwartz, and T. L. Klinkner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 072, Price codes: A05 in paper copy, A01 in microfiche. Environmental Quality Series No. 27, April 1977. 65 p, 6 tab. (California Water Resources Center Project UCAL-WRC-W-487).

Descriptors: *Planning, *Regional development, *Land use, Economic efficiency, Legislation, Management, *California, *Sacramento(Calif).

Land use planning is rapidly becoming the focus of local government efforts to manage the environment. The authors here examine in detail the implementation of the 1973 General Plan for Sacramento County, California. The report begins with an analysis of the 1973 general plan and contrats it with the earlier plan adopted in 1965. The chief goals of the 1973 plan are agricultural preservation and services efficiency. The plan achieves these goals through the redesignation of 67,000 acres of land from urban to permanent agricultural classification and through the use of growth phasing in the form of an agricultural classification and through the use of growth phasing in the form of an agricultural-urban reserve category for outlying lands. In general, implementation is determined to be effective, with the exception of a rezoning problem in a portion of the county where large lot 'hobby farms' were developed under the earlier plan.(Snyder-Calif, Davis)
W78-11364

DEVELOPMENT OF A REGIONAL INFORMATION SYSTEM FOR HYDROLOGIC MODELING,
Maryland Univ. College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7C.
W78-11379

COMPARATIVE ANALYSIS AND CRITIQUE OF THE INSTITUTIONAL FRAMEWORK FOR WATER RESOURCES PLANNING AND MANAGEMENT: CANADA, UNITED STATES, AND MEXICO,
Colorado Univ., Boulder. Dept. of Economics.
For primary bibliographic entry see Field 6E.
W78-11382

TRANSFER OF WATER RESOURCES KNOWLEDGE - AN ASSESSMENT,
North Carolina Water Resources Research Inst.
For primary bibliographic entry see Field 10F.
W78-11384

RECREATION--MARINE PROMISE.
University of Southern California, Los Angeles. Sea Grant Program.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 415, Price codes: A11 in paper copy, A01 in microfiche. Proceedings, Discussion and Overview of the National Conference on Marine Recreation, Newport Beach, CA, October 2-4, 1975, 232 p. Anderson, S.H. (editor).

Descriptors: *Marine biology, *Public lands, *Public rights, *Coastal engineering, *Recreation, *Coastal areas, Wildlife, National lakeshores, Beach erosion, Environmental control, Outdoor recreation, Boating, *Marine sanctuaries, *Water space competition, *Marine recreation, *Coastal management, *Recreation management, Biological baseline data requirements, Marine management, Inland waters.

This study of recreational uses of the marine environment is a compilation of the proceedings, discussion, and overview of the National Conference on Marine Recreation held in Newport Beach, California during October, 1975. The sponsors of the conference identified the need to resolve adequately conflicting uses of our coastal environment and provide for increased uses of this environment for recreational purposes. The conference covered such topics as the protection and allocation of marine environment resources, the research and education in coastal area protection problems, and the people's right to use these marine areas for recreation. The general purpose of the conference was to identify critical recreation uses and develop a national policy to deal with these uses without destroying the quality of the marine environment. The National Oceanic and Atmospheric Administration (NOAA) is the national body charged with providing guidelines and setting policy tones for state and local authorities to follow. Other areas needing further elucidation and integration with recreational uses included industrial responsibility in resolving the negative impacts of their activities on the marine environment, and basic research to determine the effects of human interaction and technological alterations on coastal areas. (Coan-NC)
W78-11451

REGIONALIZATION OF WATER MANAGEMENT: A REVOLUTION IN ENGLAND AND WALES,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6E.
W78-11452

ANALYSIS OF SUPPLY AND DEMAND OF URBAN ORIENTED NON-RESERVOIR RECREATION.
Army Engineer District, Sacramento, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-036 990, Price codes: A06 in paper copy, A01 in microfiche. Prepared for U.S. Army Engineer Institute for Water Resources, Kingman Building, Fort Belvoir, VA, November 1976, 103 p, 2 appendices, IWR Research Report 76-R2.

Descriptors: *Data collections, *Recreation facilities, *Methodology, *Testing procedures, *Use rates, Management, Planning, Cities, Demand, Benefits, Analytical techniques, Estimated benefits, Evaluation, *Recreation use prediction, Urban oriented recreation.

The objectives of the study were to develop a data base on use and users of urban recreation facilities which are water related but not reservoir projects, and to prepare estimating equations which produce supportable use and demand estimates. The research is one phase of a more comprehensive Corps effort to develop methodologies, procedures and guidance for estimating the use and benefits of non-reservoir projects. As explained in Appendix B of this report, the analysis and methodology developed through this phase of research needs to be replicated and validated in other locations to ensure general applicability. Follow-up research designed to provide the necessary replication is programmed, but the results will not be available for several years. In the interim, this report's methodology is applicable in planning situations having similar resource and population characteristics, and other important parameters in recreation use prediction and benefit estimation. Parts II and III of the report contain a detailed account of the data base used in the study, the methods of collecting these data, and the analytical procedures followed in developing various recreation use prediction models. Part IV deals with the actual application of the models in use prediction and benefit evaluation. (Nessa-NC)
W78-11457

FIRST ANNUAL REPORT TO THE CONGRESS OF THE UNITED STATES ON LEVEL B PLANNING.
Water Resources Council, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-11458

SECOND ANNUAL REPORT TO THE CONGRESS OF THE UNITED STATES ON LEVEL B (SECTION 209) PLANNING.
Water Resources Council, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-11459

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: REPORT.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11470

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX B--WATER SUPPLY, DEMAND AND DEFICIT.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11471

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX C--ENGINEERING FEASIBILI-

TY OF ALTERNATIVE WATER SUPPLY PROJECTS.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11472

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHEASTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX D, VOLUME I--EFFECTS OF WATER SUPPLY DEFICITS IN THE WASHINGTON METROPOLITAN AREA.
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11473

WASHINGTON METROPOLITAN AREA (WMA) WATER SUPPLY STUDY, NORTHWESTERN UNITED STATES WATER SUPPLY (NEWS) STUDY: ANNEX D, VOLUME II--SOCIO-ECONOMIC IMPACT STUDY OF ALTERNATIVE WATER SUPPLY SYSTEMS,
Army Engineer Div. North Atlantic, New York.
For primary bibliographic entry see Field 4A.
W78-11474

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN: SUMMARY REPORT.
Army Engineers District, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-11475

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN--APPENDIX A: BACKGROUND INFORMATON.
Army Engineers District, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-11476

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MANAGEMENT-APPENDIX B: BASIS OF DESIGN AND COST AND DATA ANNEX APPENDIX B: BASIS OF DESIGN AND COST.
Army Engineers District, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-11477

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN--APPENDIX C: PLAN FORMULATION.
Army Engineers District, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-11478

WASTEWATER MANAGEMENT STUDY CHICAGO SOUTH END OF LAKE MICHIGAN--APPENDIX D: DESCRIPTION AND COST OF ALTERNATIVES.
Army Engineers District, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-11479

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END OF LAKE MICHIGAN--APPENDIX E: SOCIAL-ENVIRONMENTAL EVALUATION.
Corps of Engineers, Chicago, IL. Chicago District.
For primary bibliographic entry see Field 5D.
W78-11480

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MICHIGAN--APPENDIX G: VALUATION.
Corps of Engineers, Chicago, IL. Chicago District.
For primary bibliographic entry see Field 5D.
W78-11481

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MICHIGAN--APPENDIX H: PUBLIC INVOLVEMENT/PARTICIPATION PROGRAM.
Corps of Engineers, Chicago, IL. Chicago District.
For primary bibliographic entry see Field 5D.
W78-11482

WASTEWATER MANAGEMENT STUDY FOR CHICAGO SOUTH END LAKE MICHIGAN--APPENDIX I: COMMENTS.
Corps of Engineers, Chicago, IL. Chicago District.
For primary bibliographic entry see Field 5D.
W78-11483

ECONOMIC IMPACT OF FISH TOXICANT REGULATIONS,
Northern Illinois Univ., De Kalb. Loredo Taft Field Campus.
S. Vogl, and R. Vogl.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 063, Price codes: A03 in paper copy, A01 in microfiche. IIEQ Document No. 76/16, August 1976. 46 p, 17 tab, 33 ref. 20.071.

Descriptors: *Piscicides, *Fish control agents, *Economic impact, *Illinois, *Permits, *Administrative agencies, Variance, Regulation, Illinois Pollution Control Board, Water pollution control, Herbicides, Pesticides, Costs, Governments, Administration, Jacksonville Lake(IL), Lakes, Poisons, Economics.

Proposed amendment R75-7 to Rule 203(h) on toxic substances of Chapter 3 of the Illinois Pollution Control Board's Rules and Regulations, which would eliminate the required variance for applying any aquatic toxicant to State waters, could save public and private sectors $122,289.90 annually. Under the existing regulation, costs of obtaining a variance (including a public hearing) total $2385.88 per fish kill. With the proposed change the cost to the applicant and the State for application of a fish toxicant would amount to $236, a savings of $2147.88 per permit. With approximately 141 fish toxicant permits issued annually, and assuming 5.5% come to hearing, the savings would be $117,154.90. Costs for obtaining a variance for application of an aquatic herbicide are now $368; this would drop to $238 with the proposed change. Savings on the approximately 40 annual herbicide permits would be $5135. Water quality would still be protected under the proposed amendment. Total savings, while significant, would not have a measurable effect on local government, agriculture, or commerce and industry. The principal impact would be on owners of the 73,010 private lakes, who would save $115-650 per application. For the 623 publicly owned lakes, savings could reach $2148 per permit. Lake Jacksonville was used as a case study in this report. (Lynch-Wisconsin)
W78-11484

WATER USE IN SOUTHWEST FLORIDA -- AN ECONOMICS REVIEW,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 6D.
W78-11486

ECONOMIC IMPACT OF NEW YORK'S GREAT LAKES SPORT FISHERIES,
Cornell Univ., Ithaca, NY. Dept. of Natural Resources.
T. L. Brown.
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 164-166, October 1977. 2 tab, 4 ref.

Descriptors: *New York, *Sport fishing, *Economic impact, *Salmonids, *Fish establishment, Lake Ontario, Lake Erie, St. Lawrence River, Salmon River(NY), Great Lakes, Lakes, Rivers, Niagara River, Fishing, Recreation, Fisheries, Fish hatcheries, Mirex, Lampreys, Diseases, Salmon.

Though still in a developmental stage, New York's Great Lakes salmonid fisheries have greatly improved the state's sport fishing resources and have had a significant economic impact. By 1974 stocking reached about 1.4 million coho and chinook salmon, complemented by 800,000 lake, brown, rainbow, and steelhead trout. The Great Lakes system of lakes Erie and Ontario, the Niagara River, and New York's portion of the St. Lawrence River and tributaries provided about 2.9 million angler days of fishing in 1973 (18% of the state total). Fishermen spent some $10.2 million at the fishing site (25% of the state total), and an additional $6.5 million enroute (21% of the state total). As the salmonid fisheries mature, the Great Lakes system is expected to account for an even larger proportion of New York's total angler days. A statewide estimate for all expenditure items in 1973, including estimates for licenses and major equipment purchases, was $12.88 per angler day, compared with a national average in 1970 of $7.02. The out-of-state component of total fishing trips for a 12-mi stretch of the Salmon River rose from 1% in 1973 to 9% in 1975, and overnight stays increased from 11% to 31%. Total expenditures on the river rose from $61,000 to $444,000 over the same period. Problems of sea lamprey control, disease, and mirex contamination have hampered development of the Lake Ontario fishery. (Lynch-Wisconsin)
W78-11487

ECONOMIC MEASUREMENT OF ENVIRONMENTAL DAMAGE,
Organization for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 6G.
W78-11488

DAILY FLUCTUATIONS IN CAMPGROUND USE: AN ECONOMETRIC ANALYSIS,
Oregon State Univ., Corvallis. Dept. of Economics.
R. A. Oliveira, and G. C. Rausser.
American Journal of Agricultural Economics, Vol. 59, No. 2, p 283-293, May 1977. 3 tab. 25 ref.

Descriptors: *Camping, *Recreation demand, *Model studies, *Econometrics, *Time-series analysis, *Forecasting, Recreation facilities, Camp sites, Economics, Seasonal, Diurnal, Fluctuations, ARIMA models, Box-Jenkins time-series analysis, Household production, Use rates.

Daily use fluctuations of campgrounds are analyzed in terms of recreation demand theory and time-series forecasting. Theoretical use functions are specified as the reduced form of a demand and supply system, where derived demand for campground use is based upon the household production approach to consumer demand theory. Two types of empirical models are used: (1) a pooled cross-section and time-series single equation econometric model; and (2) autoregressive-integrated-moving-average (ARIMA) models, fitted using the time-series analysis technique of Box and Jenkins. Results showed that daily campground use levels over a season can be modelled with some success, and econometric predictions were more accurate than ARIMA predictions. The econometric model was based on a casual reduced-form use model, and estimated coefficients agreed with the expected casual relationships; the overall model provided relatively more rigorous support for previous recreation research findings. ARIMA provided a time-series model to compare with the more complex and difficult-to-estimate econometric model, and although ARIMA provides no information on causal factors of campground use, it is relatively easy to employ and is useful in structuring the lag relationship of an econometric model. Campground charac-

teristics used in the econometric model included number of units, toilet facilities, swimming-fishing-boating facilities, elevation, and precipitation. (Lynch-Wisconsin)
W78-11496

BALANCING ECOLOMIC AND ENVIRONMENTAL OBJECTIVES,
Georgia Univ., Athens. Inst. of Natural Resources.
R. M. North, W. P. Neely, and R. L. Carlton.
Proceedings, Forty-second North American Wildlife Conference, p 190-202, 2 fig, 2 tab, 13 ref. (1977).

Descriptors: *Decision making, *Goal programming, *Multiple-objective planning, *Model studies, *Economics, *Environmental effects, Trade-offs, Alternative planning, Objectives, Recreation, Navigation, Florida, Cross Florida Barge Canal, Canals, Public policy, Conflict, Cost-benefit analysis, Planning, Analytical techniques, Surrogate-worth tradeoff method.

The current state of multiple-objective planning for water resources is reviewed, and the reconciliation of noncommersurable value necessary for balancing environmental and economic impacts is described and demonstrated. Decision-making and performance evaluation models have been enriched by adding multiple-objective criteria, permitting specification of a separate objective function for each of several goals. The coefficients, or measurement criteria, need not necessarily be commensurate or even explicitly converted to a common denominator. Matrices of trade-off functions need only be developed, and may be stated in primitive barter terms. Although the neoclassical theory of utility maximization embraced the concept of satisfaction through diversity, this concept became obscured in modern decision theory. Multiple-objective programming models are discussed, including the environmental evaluation system (EES), and application of goal programming is illustrated by the Cross Florida Barge Canal restudy. In the latter, a set of operational alternatives were defined, each of which would produce a different mix of economic and environmental outputs (goal achievements). The preferred solution could then be described in terms of 'highest and best use' alternatives, with weights established on the basis of technical parameters. The main purpose of goal programming is to replace the inadequate benefit-cost ratio. (Lynch-Wisconsin)
W78-11500

THE GROWTH OF ECONOMIC VALUES IN PRESERVATION: AN ESTUARINE CASE STUDY,
Oregon Univ., Eugene. Dept. of Economics.
J. M. Freidman.
Coastal Zone Management Journal, Vol. 3, No. 2, p 171-181, 1977. 1 tab, 18 ref.

Descriptors: *Estuaries, *Preservation, *Wildlife conservation, *Coos Bay(OR), *Cost-benefit analysis, Oregon, Economics, Social benefits, Forecasting, Economic justification, Decision making, Social values, Wetlands, Wildlife habitats, Economic impact, South Slough(Coos Bay OR), Sanctuaries, Ecosystems.

Establishment of the United States' first estuarine wildlife sanctuary on the south slough of Coos Bay, Oregon, is found to be socially beneficial when growth in the value of estuarine services is included in the analysis. Even assuming theoretically no systemic economic changes, the value of the south slough as an estuarine sanctuary is greater than the value of not preserving it; net social benefits of preservation are positive, equal to at least $2.5 million minus $1.6 million (the known minimum value of social benefits minus the estimated value of social costs from preservation). This paper considers several key economic issues of environmental preservation in an estuarine context in four sections: (1) estimation of the value of developing the estuary; (2) identification of the net social benefit principle for comparing development to ecological, cultural, recreational, aesthetic, historic, and economic services provided by preservation; (3) exploration of the growth of preservation values in the context of various discount rates; and (4) observations on the public value of approval of the preserve. The services provided by an estuarine sanctuary make it a store of public values, which are likely to increase over time because of growth in: (1) the population demanding estuarine services; (2) willingness to pay for such services; and (3) actual quality and quantity of services which are provided by a protected natural system. (Lynch-Wisconsin)
W78-11502

ENVIRONMENT, INTERNATIONAL TRADE AND WASTE MATERIALS,
Leicester Univ. (England). Public Sector Economics Research Centre.
For primary bibliographic entry see Field 6G.
W78-11503

INTERNATIONAL COMPETITIVE DISPLACEMENT FROM ENVIRONMENTAL CONTROL, THE QUANTITATIVE GAINS FROM METHODOLOGICAL REFINEMENT,
Wisconsin Univ.-Madison. Dept. of Economics.
J. H. Mutti, and J. D. Richardson.
Journal of Environmental Economics and Management, Vol. 4, No. 2, p 135-152, 1977. 2 fig, 20 ref, 1 append.

Descriptors: *International economics, *International trade, *Pollution abatement, *Regulation, Economics, Methodology, Equilibrium, Analytical techniques, Partial equilibrium, General equilibrium, Competition, Environmental control, Displacement, Model studies, Polluter-pays principle, Subsidies, Forecasting.

Relative merits are evaluated for increasing the sophistication of methodologies for estimating international competitive displacement of U.S. industries because of unilateral environmental controls by the federal government. Four approaches derived from the literature are evaluated, covering a range of refinement from partial equilibrium through intermediate approaches to general equilibrium. The approaches include: (1) demand-oriented industry-by-industry approaches (partial equilibrium); (2) demand-oriented comprehensive approaches (intermediate); (3) demand-oriented 'macro-orthodox' approaches (general equilibrium); and (4) supply-demand oriented 'classical' approaches (general equilibrium). In general, a carefully specified general equilibrium approach is worth the added effort, and provides considerably more information than a casually specified partial equilibrium or intuitive approach. U.S. data was used in evaluating the models, first under a polluter-pays scheme, then under subsidy-tax financing. Under both polluter-pays and subsidy financing schemes, moving from the simplest case to the intermediate model results in quite different industry projections. Including macroeconomic factors appears particularly important in the classical setting. It is further concluded that a general equilibrium approach is beneficial for predicting effects of any shock to the domestic cost of primary factors which reduces international competitiveness and displaces domestic producers. (Lynch-Wisconsin)
W78-11507

RESEARCH NEEDS RELATING TO WATER/LAND PROBLEMS IN URBANIZING AREAS.
Illinois Univ. at Urbana-Champaign. Water Resources Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 236, Price codes: A05 in paper copy, A01 in microfiche. Special Report No. 8, (UILU-WRC-78-0008), June 1978, 78 p, Patricia C. Welsh, editor. Proceedings of the Annual Meeting of the Water Resources Center, University of Illinois at Urbana-Champaign, May 16, 1978. OWRT A-999-ILL(6).

Descriptors: *Urbanization, *Urbanizing areas, *Conferences, *Research priorities, Illinois, Drainage, Water supply, Groundwater, Flood management, Storm runoff, Planning, Water quality, Community development.

Urbanizing areas often experience problems in obtaining an adequate supply of water treatment and distribution, and in ensuring that wastewater is adequately treated so as to protect the environment and, in some cases, to permit its reuse. These inherently complex problems are being made more difficult to solve by the continuing increase in the number and type of pollutants present and by the strong demand for a high-quality environment. These proceedings present assessments of the problems and of the research needed to solve them as discussed by consultants and governmental agency personnel during a one-day workshop sponsored by the Water Resources Center at the University of Illinois at Urbana-Champaign. The presentations cover topics such as groundwater and surface water supplies, drainage, flood management, the quality of storm runoff water, and planning methods as these issues affect both samll communities and major urban areas.
W78-11578

FEDERAL-STATE WATER USE RELATIONS IN THE AMERICAN WEST: AN EVOLUTIONARY GUIDE TO FUTURE EQUILIBRIUM,
Arizona. Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6E.
W78-11579

FISH, WILDLIFE, AND RECREATIONAL VALUES OF MICHIGAN'S COASTAL WETLANDS,
Eastern Michigan Univ., Ypsilanti. Dept. of Geography and Geology.
For primary bibliographic entry see Field 2H.
W78-11752

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

FIRM BEHAVIOR UNDER IMPERFECTLY ENFORCEABLE POLLUTION STANDARDS AND TAXES,
State Univ. of New York at Albany. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-11485

POLLUTION CONTROL AND TECHNOLOGICAL ADVANCE: A DYNAMIC MODEL OF THE FIRM,
Duke Univ., Durham. NC. Graduate School of Business Administration.
For primary bibliographic entry see Field 5G.
W78-11489

CONTROLLING POLLUTION BY PRICE AND STANDARD SYSTEMS: A CLARIFICATION,
Delaware Univ., Newark. Coll. of Business and Economics.
For primary bibliographic entry see Field 5G.
W78-11490

EFFLUENT CHARGES: PERSPECTIVES AND COMPARISONS,
Carnegie-Mellon Univ., Pittsburgh, PA. School of Urban and Public Affairs.
For primary bibliographic entry see Field 5G.

W78-11492

THE CASE FOR EFFLUENT CHARGES AS PART OF A NATIONAL ENVIRONMENTAL PROGRAM,
New Mexico Univ., Albuquerque, Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-11493

EFFLUENT CHARGES, A DISCUSSION PAPER,
Washington Univ., Seattle. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-11494

MARKET MODELS FOR POLLUTION CONTROL: THEIR STRENGTHS AND WEAKNESSES,
Yale Univ., New Haven, CT. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-11495

GRAIN AND FERTILIZER MOVEMENTS IN RESPONSE TO WATERWAY USER CHARGES,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
A. R. Bunker.
Illinois Agricultural Economics, Vol. 17, No. 1, p 19-26, January 1977. 4 fig, 5 tab.

Descriptors: *Grains(Crops), *Fertilizers, *Marketing, *Use rates, *Inland waterways, *Logan County(IL), Illinois, Simulation analysis, Barges, Transportation, Locks, Dams, Railroads, Trucking, Pricing, Model studies, Cost recovery.

A linear programming model, based on a 1973 survey of grain elevators and fertilizer distributors in and near Logan County, Illinois, was used to analyze effects on marketing patterns of various levels of waterway user charges on barges. User charges were also related to waterway operation and maintenance costs, and investment costs for Lock and Dam 26 at Alton, Illinois, were related to grain and fertilizer movements. Marketing and transportation of grain and fertilizer changed only slightly at operation and maintenance cost-recovery charge levels. Higher charges caused substantial switching from truck-and-barge to rail shipments, and sometimes caused major changes in the quantity of shipments through certain locations, but only small increases in the total marketing and transportation bill resulted. Major destinations for grain in the country were the Illinois River (primarily for barge transport to the Louisiana Gulf) and Decatur, Illinois, for processing. Trucks carried 78% of the grain in 1973, compared with 22% for railroads. The basic (or optimal) solution generated by the analysis requires movement of 617,754 tons of grain and 66, 408 tons of fertilizer, with total marketing and transport costs of $9.51 million; 536.1 million net ton-miles of traffic are generated, of which 88% is carried by barges, 8% by rail, and 4% by truck. (Lynch-Wisconsin)
W78-11497

NONCONVEXITY AND OPTIMAL EXHAUSTION OF RENEWABLE RESOURCES,
T. R. Lewis, and R. Schmalensee.
International Economic Review, Vol. 18, No. 3, p 535-552, October 1977. 2 fig, 20 ref, 2 append.

Descriptors: *Renewable resources, *Natural resources, *Optimization, *Exhaustion, *Economics, *Resource exploitation, Model studies, Discount rates, Fixed costs, Harvesting, Nonconvexity.

A model of optimal renewable resource exploitation shows that even with a low discount rate, conditions necessary for optimality may be satisfied by permanent abandonment of the resource after finite time. Even when a continuous-harvesting policy of the classical type also exists, satisfying the same necessary conditions, that path may not be optimal. With large fixed cost nonconvexities making harvesting at very low rates unprofitable, it may be better to exhaust the resource after finite time. The presence of nonconvexities can radically alter the nature of the optimal resource management strategy. One connot be sure without numerically evaluating alternative payoffs that continuous harvesting will be superior to abandonment. When the discount rate is low, the possible optimality of abandonment seems counter-intuitive. A key assumption of the analysis--that harvesting caanot be resumed once ceased--may not always be realistic; in some cases the cost of resuming harvesting might more logically be assigned a finite costant. Whenever neither continuous harvesting nor abandonment is optimal, all optimal policies are cyclical; after finite time the stock size enters an interval that it never leaves thereafter. When the lower bound of the interval is reached, harvesting is suspended until the stock has grown to the upper bound, at which point harvesting is resumed to draw down the stock again. (Lynch-Wisconsin)
W78-11498

WATER CONSUMPTION UNDER PEAK-RESPONSIBILITY PRICING,
Colorado Univ., Boulder. Dept. of Civil, Environmental, and Architectural Engineering.
For primary bibliographic entry see Field 6D.
W78-11499

POINT SOURCES: NEW ECONOMIC MECHANISMS,
Toronto Univ. (Ontario). Faculty of Law.
For primary bibliographic entry see Field 5G.
W78-11501

INTERTEMPORAL ENVIRONMENTAL MANAGEMENT WITH A STORABLE POLLUTANT,
Colorado Univ., Boulder. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-11506

INTERNATIONAL COMPETITIVE DISPLACEMENT FROM ENVIRONMENTAL CONTROL, THE QUANTITATIVE GAINS FROM METHODOLOGICAL REFINEMENT,
Wisconsin Univ.-Madison. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-11507

ENFORCEMENT COSTS AND THE INCENTIVE TO EVADE CONTROLS ON PRODUCTION,
South Carolina Univ., Aiken. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-11511

THE EFFECTIVENESS OF CAPITAL INVESTMENTS IN THE PROTECTION OF THE NATURAL ENVIRONMENT,
For primary bibliographic entry see Field 5G.
W78-11580

THE ECONOMICS OF POLLUTION,
For primary bibliographic entry see Field 5G.
W78-11634

DESIGN 'EFFECTIVE' COST-EFFECTIVE SYSTEMS,
For primary bibliographic entry see Field 5D.
W78-11856

6D. Water Demand

DELTA PRESERVATION OR DELTA RIPOFF. AN ANALYSIS OF THE CALIFORNIA DELTA PROTECTION ACT,
California Dept. of Justice, Sacramento.
For primary bibliographic entry see Field 6E.
W78-11304

PRIMARY SOURCES OF SOUTHERN CALIFORNIA'S WATER SUPPLY: HISTORICAL DEVELOPMENT AND SUFFICIENCY IN TIME OF DROUGHT,
Southern California Metropolitan Water District, Los Angeles.
For primary bibliographic entry see Field 3B.
W78-11325

INTERSTATE TRANSFERS OF WATER AND WATER RIGHTS--THE SLURRY ISSUE,
Davis, Graham and Stubbs, Denver, CO.
C. O. Martz, and S. L. Grazis.
Rocky Mountain Mineral Law Institute, Vol. 23, p. 33-70 (1977).

Descriptors: *Water rights, *Water transfer, *Pipelines, *Slurries, Jurisdiction, Water supply, State governments, Diversion, Water demand, Legislation, Appropriation, Competing uses.

Public demands for interstate transfer of water are growing in number and intensity. In response to these demands, states are increasingly raising jurisdictional barriers to water exportations. The right of a state to preempt the use of water either directly by legislative proscriptions on extraterritorial diversions, or indirectly by narrow definitions of lawful beneficial uses, has become a controversial issue. This issue is posed in sharp relief by recent coal slurry pipeline proposals which are focused upon in this article with emphasis on jurisdictional aspects. Another important issue to be resolved is whether the state in which a diversion is made can assert such dominion over the water source as to prohibit its delivery in interstate commerce. There appears to be little legal precedent to resolve these problems. It is suggested that the availability of water in particular cases will depend upon the character of state constitutional reservations and the strengths of local interests in protecting indigenous resources for the use of the source states. It is concluded that pipelines will be favored over the states as to appropriations that predate restrictive state legislation. (Quarles-Florida).
W78-11327

ANALYSIS OF SUPPLY AND DEMAND OF URBAN ORIENTED NON-RESERVOIR RECREATION.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 6B.
W78-11457

WATER USE IN SOUTHWEST FLORIDA -- AN ECONOMICS REVIEW,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
G. D. Lynne, and C. F. Kiker.
Economics Report No. 82, University of Florida, Gainesville, November 1976. 70 p, 3 fig, 37 tab, 32 ref, 1 append.

Descriptors: *Florida, *Economics, *Water shortage, *Water allocation(Policy), *Water users, *Water utilization, Water supply, Water demand, Agriculture, Industrial production, Mining, Domestic water, Irrigation, Pricing, Consumptive use, Water consumption(Except consumptive use).

A survey of southwest Florida, where water has become a scarce resource, showed that production

of goods and services accounts for 85% of water use in the area, compared with 15% for consumptive activities. Overall water use was estimated at 750 gal/resident/day in 1970. Major uses are mining and agricultural irrigation, which accounted for 56-67% of total water use in 1969-70; a large percentage is concentrated in Hillsborough and Polk Counties, an area of severe supply problems. Three major use classes were identified: (1) agricultural production (crop and livestock), (2) commercial and industrial production, and (3) direct consumption (personal use, cooking, cleaning, car washing, and lawn irrigation). About one-third of all farms had irrigated land, using 58 billion gallons of water on 274,000 acres in 1969; total agricultural use was 64 billion gallons. A significant portion is used directly by consumers for nonessential activities. Pricing policies for water resources should be considered an alternative to policies that lead to free water for all. Emphasis should be placed on allocation to mining and agricultural production as they are major uses, though direct consumer use should not be totally ignored. This study relied mostly on data for 1969-72, supplemented by data from 1949-68. (Lynch-Wisconsin)
W78-11486

DAILY FLUCTUATIONS IN CAMPGROUND USE: AN ECONOMETRIC ANALYSIS,
Oregon State Univ., Corvallis. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-11496

WATER CONSUMPTION UNDER PEAK-RESPONSIBILITY PRICING,
Colorado Univ., Boulder. Dept. of Civil, Environmental, and Architectural Engineering.
J. E. Flack, and G. J. Roussos.
Management and Operations, Vol. 70, No. 3, p 121-126, March 1978. 10 tab, 5 ref.

Descriptors: *Denver, *Pricing, *Water rates, *Peak-responsibility pricing, *Water supply, *Water demand, Colorado, Water users, Water meters, Model studies, Hanke-Davis model, Capital costs, Costs, Water consumption(Except consumptive use), Economics, Rates, Municipal water.

Effects on water consumption of peak-responsibility pricing, one of three alternative rate structures under study by Denver (Colorado) Water Department, are predicted using a modified Hanke-Davis seasonal-peak pricing model. If properly structured, peak-responsibility pricing can reduce water consumption and offers as attractive alternative to the present pricing system. Peak-responsibility pricing reduces the peak load and thus defers expenditures for future capacity expansion. An alternative system assumes that capacity costs should be levied only a utilization at a peak if the same type of capacity serves all users. The purpose of peak-load pricing is to make those customers responsible for the peaks pay for the extra-capacity costs. Because all three alternatives depend on the price elasticity of demand, it was necessary to assume the water system was completely metered; in fact, Denver is a mix of metered and unmetered customers. Capital costs were spread throughout the year and applied seasonally to the actual extent they contribute to extra-capacity cost. Treatment and storage facility costs, designed on the basis of maximum day, were apportioned at 37% base costs and 63% extra-capacity costs. Costs of pumping, transmission, and distribution facilities, designed on the basis of maximum hour, were apportioned at 22% base costs and 78% extra-capacity costs. Both two- and three-month peak seasons were considered. (Lynch-Wisconsin)
W78-11499

SOURCE, USE, AND DISPOSITION OF WATER IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
S. D. Leach.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 126, Price codes: A05 in paper copy, A01 in microfiche. Water-Resources Investigations 78-17, April 1978. 90 p, 11 fig, 21 tab, 25 ref.

Descriptors: *Florida, *Water utilization, *Water supply, *Surface waters, *Groundwater, Estuaries, Irrigation water, Industrial water, Municipal water, Livestock, Domestic water, Electric power production, Consumptive use, Freshwater, Saline water.

On the average, 18,420 million gallons of water was withdrawn for use in Florida each day in 1975--an increase of 3,107 million gallons per day (Mgal/d) rate since 1970. The 1975 daily total was made up of 11,502 million gallons of saline water and 6,918 million gallons of freshwater. The saline water supply, largely surface water, was pumped from tidal estuaries. Only 95.3 Mgal/d--less than 1 percent--was obtained from wells. The freshwater supply was almost equally divided between surface water (52 percent) and ground water (48 percent). Virtually all the saline water was used for thermoelectric power generation. Only 63 Mgal/d of saline water was used for all other industrial purposes. The largest user of the freshwater was for irrigation--2,868 Mgal/d. The remaining use of freshwater amounted to 1,698 Mgal/d for thermoelectric power generation; 1,146 Mgal/d for public supply; 940 Mgal/d for industrial use other than thermoelectric power generation; and 266 Mgal/d for rural domestic and livestock use. Irrigation, the largest user of freshwater, also is responsible for the greatest consumption, 1,332 Mgal/d or about half the water applied. Included in the quantity of water consumed by irrigation is that part of the conveyance loss made up of evapotranspiration--estimated at 109 Mgal/d. The remainder of the conveyance loss is returned to the ground water reservoir for reuse by seepage from the canals. (Woodard-USGS)
W78-11983

6E. Water Law and Institutions

THE PORT OF OAKLAND DECISION: CALIFORNIA OIL SPILL LEGISLATION GETS WATERED DOWN,
J. M. Lecklikner.
Golden Gate University Law Review, Vol. 7, No. 2, p. 499-534 (Winter, 1977).

Descriptors: *California, *Oil spills, *Legislation, *Judicial decisions, Oil pollution, Local governments, Legal aspects, Water pollution, Negligence, Water quality, Penalties(Legal), Pollution taxes(Charges).

The California Supreme Court recently had the opportunity to interpret state legislation addressing the problem of oil pollution. The case arose out of an oil spill in the Oakland Estuary which precipitated an action by the Califronia Attorney General pursuant to the state Water Code. The Court's holding greatly advanced environmental protection by establishing that governmental entities that pollute cannot avoid responsibility for their actions. However, the case set environmentalists back by rejecting strict liability as the standard of care for onshore oil polluters and by setting a $6000 maxium allowance for daily discharge damages. It is still not clear whether or not state courts will adopt the narrow approach taken in this case. The Supreme Court's holding is totally lacking in policy considerations, focusing instead upon grammar, syntax and definitions contained in the pertinent statutes. It is therefore difficult to assess the impact of the holding. The article concludes that California now has few safeguards to protect its water environment. Effective regulation of onshore facility oil polluters has been stymied by the Court's requirement of the state to prove negligence or intentional harm--an almost impossible task. (Quarles-Florida)
W78-11301

EXISTING WATER LAWS AND INDUSTRY PRACTICES: THEIR CONTRIBUTION TO THE WASTE OF WATER,
California State Dept. of Water Resources, Sacramento.
R. B. Robie, and M. J. Steinberg.
Los Angeles Bar Journal, Vol. 53, No. 3, p. 164-174 (September, 1977).

Descriptors: *Water utilization, *California, *Water conservation, *Water rights, Water users, Groundwater, Appropriation, Regulation, Water resources, Prescriptive rights, Surface waters, Comprehensive planning.

Some major water law doctrines and water purveying practices encourge the waste of water or at least discourage conservation. This article highlights some of these legal doctrines and industry practices in California. The Commission to Review California Water Rights Law is expected to consider many of these complex problems. Presently, most of the water used in the state is subject to no administrative regulation. Conservation has become more important with the recent drought. The article considers the establishment of guidelines for implementation of state constitutional principles to be of primary importance. This should enable courts and agencies to implement the law more effectively. Clarification of the limits of reasonable use will also inform water users what is expected of them. More efficient administrative regulation of water resources is necessary. The conjunctive use of surface and groundwater should be promoted and equitable allocations of water should be used. Applicants for water permits need to be required to demonstrate appropriate conservation efforts. Some industry practices should be reconsidered. If water use is shown to have cost elasticity, rate structures should be modified to correlate more closely with usage. (Quarles-Florida)
W78-11302

WATER RATIONING: THE VIEW FROM MARIN COUNTY,
Marin Municipal Water District, CA.
T. Thorner.
Los Angeles Bar Journal, Vol. 53, No. 3, p. 176-184 (September, 1977).

Descriptors: *Water conservation, *Water shortage, *California, *Rationing(Water), Water rates, Water demand, Water utilization, Water resources, Droughts, Economics, Environmental effects, Water users.

The current California drought has brought about a surprising willingness of people to carry out water conservation and rationing in innumerable ways. These practices are expected to continue after the drought ends. Water rationing is a mandatory program to limit water use, whereas water conservation is generally a voluntary program to minimize unnecessary resource consumption. This distinction has become blurred in California during the drought. The Marin Municipal Water District has been a testing ground for water conwervation and rationing programs. This article traces the steps taken by the District's Board of Directors to achieve tremendous water savings. The legal basis of the District's power to restrict water use is examined. The various water rationing programs that the District utilized at various times are explored. Voluntary rationing has no sanctions and consists only of appeals to consumers. Mandatory rationing with restrictions or mandatory rationing by allotments is also available. Price incentive rationing adjusts water rates so that those who fail to con-

serve water get higher bills. Types of enforcement are explained as well as bans on new water hookups. (Quarles-Florida)
W78-11303

DELTA PRESERVATION OR DELTA RIPOFF. AN ANALYSIS OF THE CALIFORNIA DELTA PROTECTION ACT,
California Dept. of Justice, Sacramento.
G. K. Wilkinson.
Los Angeles Bar Journal, Vol. 53, No. 3, p. 152-162 (September, 1977).

Descriptors: *California, *Water supply, *Water users, *Water rights, Legislation, Water resources development, Droughts, Water conservation, Water demand, Water distribution(Applied), Water utilization, Water delivery.

The severity of the present drought in California has revived the Sacrameno-San Joaquin Delta Protection Act (Act). This legislation authorized the California Water Resources Development System for the State Water Project (SWP). Three cases are pending which challenge the efforts of the California Department of Water Resources and the State Water Resources Control Board to deal with the water shortage issue. Central Valley water users claim the state must export more water from the Delta to benefit Valley farms. The opposing side views the Act as requiring the cessation of exports until the Delta is fully serviced. This article suggests that a median of these two views should be applied. It suggests that the Act requires protection of the Delta equivalent to the protection that would have existed absent the SWP and federal Central Valley project. A higher level of protection is available if public interest requires it. The act does not create a vested right to water released for storage in the SWP. Delta interests should have the opportunity to obtain such water, but it should be purchased and then only when it is reasonable to do so. (Quarles-Florida)
W78-11304

OIL POLLUTION LAW AND THE LIMITATION OF LIABILITY ACT: A MURKY SEA FOR CLAIMANTS AGAINST VESSELS,
Kelley, Drye and Warren, New York.
F.E. Sisson, III.
Journal of Maritime Law and Commerce, Vol. 9, No. 3, p. 285-341 (April, 1978).

Descriptors: *Oil spills, *Oil pollution, *Water Quality Act, *Penalties(Legal), Ships, Legal aspects, Florida, Legislation, Insurance, Oceans, Federal Water Pollution Control Act, Compensation.

The 1851 limitation of Liability Act (LLA) still affords shipowners protection from extensive claims of parties injured by or as a result of their vessel. Liability cannot exceed the amount of value of the interest of such owner in such vessel, and its freight, provided the owner lacks privity or knowledge relating to the cause of the loss. Since the LLA's enactments, the group of possible victims has grown to include entire beachfront communities in the case of an oil spill. Naturally, potential damage of this type could prove much greater than the salvage value of one vessel afer such an incident. With the increasing frequency of oil spills, the need for new oil pollution laws became apparent. Appropriate federal legislation was adopted as well as various state legislation. Florida's tough Oil Spill Prevention and Control Act was upheld in the Supreme Court. however, there is an extreme need to clarify the interrelationships among federal law, state law and the LLA which all relate to the issue of oil spill liability. This article attempts to identify the conflict present and stresses the need for legislative clarification. (Quarles-Florida)
W78-11305

FEDERAL APPROPRIATION AND THE RECLAMATION ACT OF 1902,
P. E. Hofmeister.
Nebraska Law Review, Vol. 57, No. 2, p. 403-441 (1978).

Descriptors: *Federal Reclamation Law, *Federal-state water rights conflicts, *National Water Commission, *Water rights, Reclamation, California, Unappropriated water, Beneficial use, Water utilization, Water demand, Reclamation states, Prior appropriation.

Recent litigation has renewed the dispute involving state control over federal reclamation projects in the arid Western states. Western states use the doctrine of prior appropriation in distributing water rights. This requires that the water be put to a beneficial use which is determined by state authority. When the federal government is the appropriator, the question is raised as to whether the federal government is bound to comply with conditions imposed by the state. The latest interpretation of Section 8 of the reclamation act was delivered in United States v. California. The court held that the Bureau of Reclamation must comply with state law, but the state must grant the permit with no requirement that the Bureau comply with state conditions if there is unappropriated water available. This article explores the problems generated by this opinion, and suggests the solution reached by the court is not a satisfactory one. A more just result might be reached through legislation proposed by the National Water Commission which suggests that the federal government recognize and follow state water law as long as it is consistent with federal purposes. (Quarles-Florida)
W78-11306

INTERNATIONAL AQUIFER MANAGEMENT: THE HUECO BOLSON ON THE RIO GRANDE RIVER,
Waterloo Univ. (Ontario).
J. C. Day.
Natural Resource Journal, Vol. 18, No. 1, p. 163-179 (January, 1978). 4 fig.

Descriptors: *Equitable appointment, *Groundwater resources, *Mexico, *Texas, Political aspects, Groundwater basins, Water resources development, Comprehensive planning, Coordination, Aquifer management, Water supply, Water demand.

The Hueco Bolson is a groundwater reservoir share by the United States and Mexico. As demand increases, joint management and international cooperation is needed to avoid potential groundwater conflicts. Studies are needed to estimate available resources, projected population and per capita consumption in each country. Management alternatives limiting water appropriation to practical sustained yields of local surces should ensure that each country receives an equitable amount of groundwater by compensating for major international drawdown induced by each country in the other. Further investigation is needed on the potential to mine aquifers during dry periods and to replenish them during wet years without impairing the existing freshwater reosurce by salinization, other contaminants, or aquifer subsidence. A major obstacle to cooperation appears to be Texas laws which regard groundwater as a resource belonging to individual property owners. The individual owners are entitled to unlimited pumping even if such action should deplete reserves or impair water quality. In order to achieve ground-water management cooperation, politically feasible alternatives to groundwater control in the Texas part of the Hueco Bolson must be explored and implemented. (Baumbach-Florida)
W78-11309

SCIENCE, SOVEREIGNTY AND THE THIRD LAW OF THE SEA CONFERENCE,
Lewis and Clark Coll., Portland, OR. Natural Resources Law Inst.
R. Winner.
Ocean Development and International Law Journal, Vol. 4, No. 3, p. 297-329 (1977).

Descriptors: *Law of the sea, *Oceans, *Conferences, *Research and development, Treaties, International law, Mining, Exploration, United Nations, International waters, Regulation, Future planning(Projected).

Among the many fields of endeavor that will be affected by the outcome of the Third United Nations Conference on the Law of the Sea is marine scientific research. This article examines how proposed treaties would affect such research. The major aspects of the treaties would: inpose substantial restrictions on the conduct of marine scientific research; impose a foundation of regulations and consent powers for over one-third of the ocean; avoid a patchwork of coastal state regulations; and restrain overly territorialist states. In the formulating of the treaties developed research states battled developing coastal states with the outcome favoring the latter. There are still widespread differences on the issues of deep seabed mining and consent powers over research in coastal areas, which indicate a final treaty may be years away. The author suggests it is unlikely a workable, widely supported treaty will be agreed upon. Nevertheless, the negotiations are said to have benefited international Law by paving the way for increased regulation and pre-arranged agreements between nations with respect to marine scientific research. (Spector--Florida)
W78-11310

OIL AND WATER,
G. E. Studds.
Trial, Vol. 13, No. 3, p. 43-47 (March, 1977).

Descriptors: *Oil spill, *Oil pollution, *Compensation, *Damages, *Ships, Coast Guard regulations, Coasts, Transportation, Negligence, Storage tanks, Oil, Oil wells, Fishing, Oil industry, Commercial fishing, Resources, Offshore platforms, International waters, International law, Natural resources.

Oil spill liability laws are urgently needed to provide a system of compensation for damages to fishing resources, related industry, and affected individuals. Presently, the Coast Guard has no authority to investigate spills of oil or to obtain compensation for cleanups. Recent tragic spills point out the need to: (1) set high standards of liability for those transporting oil within 200 miles of our shore; (2) require the posting of a bond equal to liability before allowing a vessel to enter our waters; and (3) create a quick and equitable mechanism for those damaged to obtain compensation. In this article, a United States Congressman describes how his proposed bill would require domestic and foreign vessel owners to obtain federal certificates of responsibility which would demonstrate their ability to meet the costs of an oil spill. The bill would also set liability limits for deepwater ports, and for offshore oil production, storage and transportation facilities. In addition, it would create a fund which would compensate claimants and then proceed to seek reimbursement from the spiller. The author argues that the United States must proceed unilaterally to protect its natural resources and economy from devasting oil spills because international standards will not be stringent enough. (Spector-Florida)
W78-11311

THE ORIGINS OF THE 200-MILE OFFSHORE ZONES,
Johns Hopkins Univ., Washington, DC. Ocean Policy Project.
A. L. Hollick.

American Journal of International Law, Vol. 71, No. 3, p. 494-500 (July, 1977).

Descriptors: *Law of the sea, *Fishing, *South America, *International law, United Nations, Conferences, History, International waters, Jurisdiction, Coasts, Resources, Regulation.

On March 1, 1977 the United States extended its fisheries jurisdiction limit from 12 to 100 miles offshore. This move--expected for many years--further universalized the 200-mile limit. Many other nations had already claimed a 200-mile territorial sea and negotiations are under way at the Third United Nations Law of the Sea Conference to establish 200-mile economic zones worldwide and negotiate resulting conflicts. This article traces the historical origins of the 200-mile limit. The author presents an interesting analysis of the chronological history of this limit's acceptance around the world from when it was first declared by Chile in 1947 up to the 1977 United States declaration. It originated due to the concerns of a weak Chilean whaling industry and in mistaken interpretation of a 1939 security zone declaration issued by then President of the United States Franklin Roosevelt. It grew through economic and political necessity to the point where today the Law of the Sea Conference must come to grips with virtually worldwide application. (Spector-Florida)
W78-11312

REFLECTIONS ON WASHINGTON'S COASTAL ZONE MANAGEMENT PROGRAM,
Washington State Dept. of Ecology, Olympia. Shoreline Div.
R. Mack.
Coastal Zone Management Journal, Vol. 3, No. 4, p. 325-330 (1977).

Descriptors: *Legislation, *Washington, *Management, *Shore pollution, Coasts, Permits, Regulation, State jurisdiction, Comprehensive planning, Public benefits, Water resources development, Environmental effects.

On June 1, 1976 the Secretary of Commerce approved the Washington (state) Coastal Zone Management Program (WCZMP) which created a cooperative partnership between the state's Department of Ecology and its local governments. The WCZMP requires and defines in detail a planning program and a regulatory permit system, both of which are initiated at the local level and are subject to state overview. The WCZMP covers all lakes more than 20 surface acres in size, all streams with a mean annual flow of more than 20 cubic feet per second, all marine waters and lad up to 200 feet inland therefrom, and all marshes, bogs, swamps, and tidal waters. This article lists features which contributed to the success of the WCZMP and cautiously predicts the successful enactment of similar state laws encouraging coastal zone management. Contributing features listed include: public concern (evidenced by petitions to the legislature); public support; public involvement; state executive branch support; and continuing legislative overview. The article also traces selected features of the 1971 Shoreline Management Act, which the WCZMP was patterned after. These iclude local emphasis, state responsibility where the localities fail to act, a regulatory program, and integration of state and local management processes. (Spector-Florida)
W78-11313

COMMON LAW V. STATUTORY POLLUTION ABATEMENT: THE TEXAS ATTORNEY GENERAL'S DILEMMA,
South Texas Law Journal, Vol. 18, No. 3, p. 557-571 (1977).

Descriptors: *Texas, *Pollution abatement, *Common law, *Administrative agencies, Air pollution, Water pollution, Water quality, Legislation, Legal aspects, State governments, Water law, Regulation.

The responsibility for the protection of the general public in the maintenance of the quality of the environment in Texas has always rested with the state attorney general. This article concludes that this responsibility should continue under the attorney general's authority despite the discretionary powers of several state agencies with the authority to abate pollution. The attorney general's power originates with the common law right of the sovereign to abate a public nuisance. However. Texas law now gives the Department of Natural Resurces and Air Control Board power to direct the attorney general go to bring suit to abate water and air pollution. This article explores the question of whether the attorney general retains his common law power to abate or whether that rights is preempted by legislation which grants the power to bring pollution abatement suits in the state agencies. The historical background of the attorney general's power is examined along with the purpose and intent of pertinent legislative acts. The exercise of the common law powers is discussed, as is enforcement of the air and water pollution abatement acts. (Quarles-Florida)
W78-11314

GROUNDWATER PROTECTION IN THE CHRISTINA BASIN,
Pennsylvania Univ., Philadelphia. Center for Ecological Research in Planning and Design.
For primary bibliographic entry see Field 4B.
W78-11315

SOLVING THE PROBLEM OF THE DEEP SEABED: THE INFORMAL COMPOSITE NEGOTIATING TEXT FOR THE FIRST COMMITTEE OF UNCLOS III,
New York University Journal of International Law and Politics, Vol. 9, No. 2, p. 177-201 (Fall, 1976).

Descriptors: *Law of the sea, *International law, *United Nations, *Ownership of beds, Treaties, Continental shelf, Fishing, Technology, International waters, Oceans, Exploitation, Resources development.

In the realm of international discussion of seabed regulation, the task has become to devise forms of ocean enterprise providing incenives for entrepreneurs to undertake operations while safeguarding the international community. At the same time, countries that cannot be enterpreneurs because of their geographical, financial or technical positions should be actively associated with the exploitation of oceanbed resources. The United Nations' First Committee is very close to agreement on implementation of the above standard. This would probably preserve the seabed for the benefit of all mankind and avoid international conflict over the seabed exploitation issue. A sufficient number of states are expected to accept this proposal in order to avoid utter chaos. If the proposition fails, the future of the seabed will become uncertain. National legislation purporting to grant seabed mining rights might shape international law until some future international control. The situation at hand arose because customary international law was outrun by technolgical change. The authors strongly urge mankind to seize this moment, that has made itself available to shape their own destiny. (Quarles-Florida)
W78-11316

PUMPING BILLIONS INTO THE DESERT--THE CASE AGAINST THE CENTRAL ARIZONA PROJECT,
D. Hanson.
Audubon, Vol. 79, No. 3, p. 133-145 (May, 1977).

Descriptors: *Dams, *Colorado River Basin, *Water distribution(Applied), *Arizona, Deserts, Water supply, Water rights, Water storage, Dam design, Environment, Administrative agencies, Indians, Indian reservations, Water pollution, Water policy, Water demand, Irrigation, Evaporation, Rivers, River basin development.

The Central Arizona Project (CAP) is one of 19 water projects that President Carter ordered reviewed prior to new spending. Arizona's surface and groundwater resources, and its desert characteristics are discussed along with a brief history of water use, regulation, and econimics. The federal Bureau of Reclamation (BOR) conceived the CAP to meet increasing water demand by tapping the Colorado River. Prior to the CAP receiving Congressional athroization, the issue of water rights among the Colorado River basin states was resolved by the United States Supreme court in Arizona v. California, resulting in the allocation of specific quantities of Colorado River flow to each state. The design of the CAP is outlined and compared with past BOR irrigation projects. Water quality and pollution consequences are discussed. The article criticizes the following benefits claimed for the CAP: (1) increased water supply for agriculture; (2) community growth; (3) hydroelectric power; (4) reduced unemployment; and (5) money for Indians. The author concludes that the following considerations support major design changes in the CAP: inundation of Indian lands; potential dam failure; adverse enfironmental impacts; high costs; and availability of engineering alternatives and water convservation technology. (Hoofman-Florida)
W78-11317

THE FISHERY CONSERVATION AND MANAGEMENT ACT OF 1976: STRUCTURE AND FUNCTION OF A CONTIGUOUS ECONOMIC ZONE,
A. S. Anderson.
Texas International Law Journal, Vol. 12, p. 331-353 (Spring, 1977).

Descriptors: *Boundary disputes, *Commercial fishing, *Fish conservation, *International law, *Law of the sea, Adadromous fish, Coasts, Continental margin, Fish, Fish management, Foreign countries, Legal aspects, Legislation, Internationl waters, United States, Water law, Water policy, Water rights.

The Fishery Conservation and Management Act of 1976 unilaterally created a fishing zone which extends the jurisdiction of the United States to a line two hundred miles from the baseline of the territorial sea of the United States. It is expected that the adoption by the United States of this exclusive economic zone will greatly accelerate the worldwide trend toward doing the same. Congress expressed its determination that pressure from foreign fishing fleets and the ineffectiveness of international fishery agreements have contributed to the problem of overfishing. Congress approved the Act despite the possiblity that unilaterally created economic zones violate international law. Certainly such action conflicts with the well-established principle that fishing is a traditional freedom of the open sea. In view of the fact that almost all nations favor an exclusive zone delimitation of 200 miles, a claim that such a unilaterally created zone is illegal is moot at best. Such unilateral action may very well obstruct international cooperation, but the exclusive economic zone may also offer the most realistic option around which to build a world consensus on oceanic resources. (Jordan-Florida)
W78-11318

POLYCHLORINATED BIPHENYLS TOXIC POLLUTANT EFFLUENT STANDARDS,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-11319

A CASE ANALYSIS OF POLICY IMPLEMENTATION: THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969,
Arizona Univ., Tucson. Inst. of Government Research.
H. J. Cortner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 679. Report NSF-RA-E-75-178 May, 1975. 32 p.

Descriptors: *Environmental control, *Judicial decisions, *Legislation, *Analysis, Project post-evaluation, Administrative decisions, Decision making, Water resources, Political aspects, Environment, Comprehensive planning.

The 1969 National Environment Policy Act (NEPA) was not only implemented by the 'proper administration' but also be legislation, private interest groups, the president, and the courts. This article focuses on the interactions of these political actors in NEPA's implementation process, with special emphasis on the Lake Powell (California) Research Project. That region was experiencing converging demands for water and energy resource development, preservation of scenic features, expansion of recreational facilities, and economic development. The requirements for the preparation of Environmental Impact Statements under NEPA affected decision-making for management of the region's energy resources. Because of presidential and congressional oversight--specifically a failure to interpret the Act and to specifically direct its enforcement and implementation--and because environmentalist groups were anxious to have implemented what they perceived NEPA to be, the courts assumed an active role in NEPA's implementation. The judicial activism brought with it an over-emphasis of procedure over substance, however, resulting in a significant gap between NEPA's statutory intent and its actual policy performance. NEPA has had only a modicum of success at creating and maintaining environmental integrity and reforms in environmental dicision-making. (Spector-Florida).
W78-11320

THE DULUTH EXPERIENCE--ASBESTOS, WATER, AND THE PUBLIC,
Minnesota Dept. of Water and Gas, Duluth.
For primary bibliographic entry see Field 5F.
W78-11321

A CRITICAL APPRAISAL OF PROPOSED CHANGES TO THE 1972 WATER POLLUTION CONTROL ACT,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5G.
W78-11322

LAW OF THE SEA BECALMED,
Council on Foreign Relations, Washington, DC.
J. T. Swing.
Oceans, Vol. 9, No. 6, p. 62-63 (November, 1976).

Descriptors: *Resources development, *Oceans, *United Nations, *Conferences, International law, Regional economics, Decision making, Negotiations, Relative rights, Resource allocation, Law of the sea, Mining.

The fourth substantive negotiating session of the Third United Nations Conference on the Law of the Sea ended with many issues unresolved. Negotiations were most seriously split over how to control the extraction of deep sea-bed minerals. Developed nations insisted upon secured access as essential to the large capital investments that will be required for production. Developing countries favored a monopolistic authority with control over marketing to protect the economics of developing land-based mineral producting states. The developing countries defeated or compromise 'dual access' proposal which would have assured industrialized states access to one-half of the mineral nodule fields while leaving the balance of the sites to be developed by the new international Seabed Authority. Unresolved 200-mile economic zone issue included: (1) whether zone area would remain high seas except for the specified economic rights granted to coastal states; (2) whether all scientific research in the zones would require prior coastal state consent; and (3) what measure of access to resources and transit rights within the zone would be granted to landlocked states. Negotiations on international dispute settlement mechanisms were also unresolved. (Baumbach-Florida).
W78-11323

A MULTI-FACETED, MULTI-AGENCY DETECTION, RESEARCH AND ENFORCEMENT PROGRAM.
Sea Technology, Vol. 18, No. 10, p. 10-17, 49-50 (October, 1977).

Descriptors: *Administrative agencies, *Oceans, *Pollution abatement, *Comprehensive planning, Inter-agency cooperation, Regulation, Law enforcement, Exploration, Water pollution control, Standards, Research and development, Water policy.

An array of governmental agencies is involved in detection, cleanup and research aspects of ocean pollution. The Environmental Protection Agency administers an ocean dumping permit system and expects to have drastically reduced all ocean sewage sludge dumping by 1981. The U.S. Coast Guard helps enforce the permit system by monitoring and spot checking permittees. The Coast Guard is also responsible for coordinating the cleanup of oil spills and other polluting disasters. The Energy Research and Development Administration is involved in determining the effects of energy production along the United States' shorelines and the continental shelf. Assessing the effects of a major oil spill is primarily the responsibility of the National Oceanic and Atmospheric Administration (NOAA). NOAA is charged with monitoring and predicting the probable effects of dumping on the ocean environment, and is also investigating the environmental impact and amount of yield of possible future manganese nodule mining operations from deep ocean beds. Defense agencis are also involved in the clean ocean effort. The U.S. Navy is currently altering ships and upgrading equipment with the aim of eliminating all international discharge of koil and oily wastes. (Baumbach-Florida).
W78-11324

PRIMARY SOURCES OF SOUTHERN CALIFORNIA'S WATER SUPPLY: HISTORICAL DEVELOPMENT AND SUFFICIENCY IN TIME OF DROUGHT,
Southern California Metropolitan Water District, Los Angeles.
For primary bibliographic entry see Field 3B.
W78-11325

ORE MINING AND DRESSING EFFLUENT GUIDELINES--TO BPT OR NOT TO BPT,
American Mining Congress, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-11326

INTERSTATE TRANSFERS OF WATER AND WATER RIGHTS--THE SLURRY ISSUE,
Davis, Graham and Stubbs, Denver, CO.
For primary bibliographic entry see Field 6D.
W78-11327

QUALITY V. QUANTITY: THE FEDERAL WATER POLLUTION CONTROL ACT'S QUIET REVOLUTION IN WESTERN WATER RIGHTS ADMINISTRATION,
Debevoise and Libeman, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-11328

ENVIRONMENTAL LAW: GOVERNMENTAL SUSPENSION OF OUTER CONTINENTAL SHELF OIL DRILLING OPERATIONS,
J. T. Latting.
Oklahoma Law Review, Vol. 30, No. 4, p. 930-937 (Fall, 1977).

Descriptors: *Offshore platforms, *Drilling, *Oil wells, *Resources development, Continental shelf, Oil, Exploration, Leases, Regulation, Environmental effects, Oil pollution, Administrative decisions.

In 1953 Congress enacted the Outer Continental Shelf Lands Act which authorized the Secretary of the Interior to grant oil and gas leases on submerged lands of the outer continental shelf to the highest qualified bidder. In 1968 Union Oil, in bidding competition with other major oil companies, was granted a lease in Santa Barbara (California) Channel and subsequently installed two offshore drilling platforms there. After permission to erect a third platform was granted, the infamous oil blowout occurred on one of the first two platforms. After the completion of environmental studies, the Secretary continued a previous suspension of various leases and withdrew permission to erect the third platform. Four major oil companies filed suit to set aside and enjoin future interference by the Secretary. This article explores the major issue of the suit-the power of the Secretary to regulate oil and gas leases under the Act. After discussing the disposition of the case, the article concludes with an examination of the implications of offshore oil development. It suggests that there are better ways to discourage offshore development than to unjustly inflict great economic loss on oil companies. (Quarles-Florida).
W78-11329

PUBLIC BEACH ACCESS: A GUARANTEED PLACE TO SPREAD YOUR TOWEL,
Spessard L. Holland Law Center, Gainesville, FL.
F. E. Maloney, D. Fernandez, A. R. Parrish, and J. M. Reinders.
University of Florida Law Review, Vol. 29, No. 5, p. 853-880 (Fall, 1977).

Descriptors: *Public access, *Beaches, *Public rights, *Local governments, Recreation, Beach erosion, Land development, Adverse possession, Federal government, State government, Eminent domain, Prescriptive rights.

Greater protection of the right to secure public beach access is needed in the legal system. This is the conclusion of this article which notes that the public's right to the foreshore is diminishing as upland and drysand areas become more developed. The burden of securing greater public access rests largely on local governments until state and federal governments provide sufficient funds to purchase an adequate supply of public beaches. A model Beach Access Ordinance is provided to aid local governments in securing such access. The disappearance of public beaches is blamed on erosion as well as increased private control. Only Texas and Oregon have passes strong state legislation to protect public beach rights. As background to the model ordinance, the discussion focuses on common law theories supporting public beach rights, state and federal legislation, and the 'taking' issue. This last area is especially relevant in the area of mandatory dedication of land by developers prior to subdivision plat approval. The common law theories examined include custom, dedication, prescription and the public trust doctrine. (Quarles-Florida).
W78-11330

A LEGAL REGIME FOR THE ARCTIC,
B. J. Feder.

Ecology Law Quarterly, Vol. 6, No. 4, p. 785-829 (1978).

Descriptors: *Arctic Ocean, *Law of the sea, *Environmental effects, *Resources development, Oil, Economics, International law, International waters, Exploitation, Climates, Continental shelf, Antarctic.

The law of the sea is the dominant legal regime of the Arctic Ocean. Recently, the potentially vast resources available in the Arctic has resulted in an increasing interest in this area. The efforts of the law of the Sea Conference to rewrite the law of the sea coincide with the growing interest. The unique environmental hazards of resource exploitation in the Arctic raises doubts about including in the new legal regime formulated at the Conference. The Conference has tended to emphasize control and development of the oceans as an economic resource with less concern for environmental issues. The first section of this article discusses the physical and environmental characteristics of the Arctic, and Arctic, and concludes that the ocean there is at most quasi-oceanic in character. Part two examines the traditional law of the sea and its application to the Arctic region with emphasis on environmental implications. The creation of a special Arctic legal regime based on environmental protection principles is urged. An outline of such a regime's structure is included and obstacles to this type of agreement are identified. (Quarles-Florida).
W78-11331

THE THIRD UNITED NATIONS' CONFERENCE ON THE LAW OF THE SEA: THE 1977 NEW YORK SESSION,
Miami Univ., FL. School of Law.
B. H. Oxman.
American Journal of International Law, Vol. 72, No. 1, p. 57-83 (January, 1978).

Descriptors: *United Nations, *Law of the sea, *International law, *Conferences, Oceans, Exploitation, Internal water, Navigation, Fisheries, Continental shelf, Treaties, International waters.

The sixth session of the Third United Nations' Conference on the Law of the Sea was held in 1977. Although the controversy over the deep seabeds issue has threatened to collapse the Conference, participants are on the verge of agreement on the entire law of the sea excepting this issue. After a brief comment on deep seabeds, this article explores other important issues including: (1) internal waters, the territorial sea, and the contiguous zone; (2) straits used for international navigation and archipelagic states; (3) the exclusive economic zone; (4) scientific research; (5) dispute settlement; (6) fisheries; (7) delimitation; (8) enclosed and semi-enclosed seas; and (9) the continental shelf. The article conclused with a summary of the progress conference has made. The Conference dealt with the geographic scope of the territorial sea, continental shelf, and high seas, reducing the area of the latter by one third. The Conference provided for unimpeded transit for international navigation. It further established a 200-mile economic zone with coastal state jurisdiction over the continental margin beyond this. Precise rules were established in the field of environmental law and provisions for binding arbitration to settle disputes were set forth. (Quarles-Florida).
W78-11332

LAW OF THE SEA-DEVELOPING COUNTRIES' CONTRIBUTION TO THE DEVELOPMENT OF THE INSTITUTIONAL ARRANGEMENTS FOR THE INTERNATIONAL SEA-BED AUTHORITY,
United Nations Secretorial New York. Office of Legal Affairs.
A. O. Adede.
Brooklyn Journal of International Law, Vol. 4, No. 1, p. 1-42 (Fall, 1977).

Descriptors: *Law of the sea, *International commissions, *Ownership of beds, *United Nations, Oceans, Mineral industry, Continental shelf, Resources, Resources development, Exploitation, Exploration, Mining.

Reservation of the sea-bed and ocean floor underlying the high seas beyond the limits of national jurisdiction for peaceful purposes has been an issue of United Nations' concern. The increased exploration and exploitation of these mandated the formulation of a just legla framework to allow these activities to benefit mankind. This article looks briefly at the work of the United Nations in this area since 1967. It then proceeds to explore the most recent developments of the third United Nations Law of the Sea Conference in designing the institutional arrangements for an international sea-bed authority. There is particular focus upon developing countries'i contributions in this area. The establishment of an authority of this type was a unique exercise. The organization will not only regulate countries involved in sea-bed exploitation, but it will also actively carry on the business of exploiting the sea-bed resources on behalf of mankind. This latter role makes the authority unlike any previous international authority and therefore impossible to pattern after any traditional model. (Quarles-Florida).
W78-11333

ENFORCING THE FEDERAL WATER RESOURCE SERVITUDE ON SUBMERGED AND RIPARIAN LANDS,
Department of Justice, Raleigh, NC. Eastern Div.
B. H. Johnson.
Duke Law Journal, Vol. 1977, No. 2, p. 347-388 (May 1977).

Descriptors: *Federal Water Pollution Control Act, *Rivers and Harbors Act, *Federal jurisdiction, *Law enforcement, Legislation, Regulation, Penalties(Legal), Legal aspects, Pollution taxes(Charges), Court decisions, Water conservation, Water management(Applied).

As presently construed, the 1899 Rivers and Harbors Appropriation Act and the 1972 Federal Water Pollution Control Act Amendments together create federal easements over most of the waters of the United States. Enforcement of these easements, however, has proved complex. Administrative and judicial enforcement proceedings have tended to resolve each case on an ad hoc basis. Minor violations of the acts are more apt to result in costly litigation than serious violations which require extensive corrective work simply because administrative agencies lask the means to deal effectively with the minor violations. Legislation is required to correct this situation. By giving the U.S. Army corps of Engineers and the Environmental Protection Agency the authority to impose and collect civil penalties for certain classes of minor violations, a great deal of largely unnecessary litigation could be eliminated. Administrative restoration and cease-and-desist orders, and self-help procedures should also be considered. The range of judicial remedies is broad enough, however, they should be applied in a consistent manner. This author suggests establishing the remedial injuction as the preferred remedy. Then, judicial delineation of appropriate exceptions would accomodate both uniformity and fexibility needs. (Baumbach-Florida).
W78-11334

HOUSE-SENATE COMMITTEE COMPROMISES ON PL 92-500,
R. Roberts.
Water and Sewage Works, Vol. 124, No. 12, p. 1, 4, 55. (December, 1977).

Descriptors: *Water quality standards, *Law enforcement, *Waste water treatment, *Water policy, Federal Water Pollution Control Act, Legislation, Regulation, Water reuse, Waste water reclamation, Alternative planning, Administration, Economic justification.

This committee conference bill was due for submission to the House and Senate at the time of its description in this paper. Its major provisions responded to legal, technological and administrative needs engendered by the 1972 laws. It included a five year extension of the federal grant program for municipal waste treatment plants. It followed the recommendations of the National Commission on Water Qualtiy in requiring that higher than 1977 treatment requirements for conventional type industrial waste be justified in terms of the higher costs involved. It specified which toxic substances would warrant imposition of the higher 1983 or even 'zero discharge' standards. A modification of the grant evaluating system permitted routine administration of the program by qualified states. Since only 35 percent of municipalities had met 1977 requirements for secondary sewage treatment, the bill provided for time extensions where federal funds had been unavailable. Communities which emphasize recycling, reclaiming and reuse of water would be eligble for 85 percent federal share of project costs, rather than the 75 percent in the case of conventional treatments. (Baumbach-Florida)
W78-11337

UNDERGROUND INJECTION ON LIQUID WASTE CAN BE ENVIRONMENTALLY SOUND,
Texas Water Quality Board, Austin.
J. W. Mullican.
Water and Sewage Works, Vol. 124, No. 12, p. 62-63 (December, 1977).

Descriptors: *Injection wells, *Waste disposal wells, *Underground waste disposal, *Texas, Waste disposal, Ultimate disposal, Regulation, Water pollution control, Design standards, Permits, Groundwater resources, Monitoring.

With proper safeguards, man-made waste can be disposed of in sealed underground wells. This process, called 'injection', is regulated in Texas by the Texas Water Quality Board (TWQB) in accord with the Texas Water Code. The TWQB issues permits after thorough engineering and geological evaluations are made of the waste character, well design, construction, operation and monitoring program. Certain of the drilling completion and testing phases are witnessed by the Board's technical staff. TWQB policy is to permit injection only after reasonable alternative methods have been evaluated and found to be less desirable in terms of environmental protection and dependability. State law allows injection only if: (1) the installation is in the public interest; (2) no existing rights will be impaired; (3) with proper safeguards, both ground and surface fresh waters can be adequately protected from pollution. The TWQB conducts routine inspections of permitted operations. In addition, each permittee must keep records of: surface injection pressures, volume injected, injection rates, periodic well tests. In the event a permit is cancelled or the well is abandoned, the permittee must submit for approval plans for plugging and abandoning the well. (Baumbach-Florida)
W78-11338

THE IMPLICATIONS OF SURFACE AND SUBSURFACE MINING POLICY FOR GROUNDWATER PROTECTION IN PENNSYLVANIA,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Div. of Mine Drainage Control and Reclamation.
For primary bibliographic entry see Field 5G.
W78-11339

REMEDIES IN ADMIRALTY FOR OIL POLLUTION,
Duncan, Brown, Weinberg and Palmer, Washington, DC.

For primary bibliographic entry see Field 5G.
W78-11342

B&W CONSTRUCTION, INC. V. CITY OF LACEY (CITY LIABLE FOR PROPERTY VALUE DECLINE IN INVERSE CONDEMNATION SUIT).
577 P. 2d 583-588 (Wash. Ct. App. 1978).

Descriptors: *Washington, *Property values, *Condemnation, *Storm runoff, Condemnation value, Damages, Sewers, Effluents, Eminent domain, Percolation, Bogs, Penalties(Legal).

Defendant, a Washington municipal government, sought review of a judgment awarding damages to plaintiff property owner as a result of the construction of a municipal sewer system that discharged effluent onto plaintiff's land. Defendant widened a road near plaintiff's property and constructed a storm sewer system nearly the entire length of the road. Some of plaintiff's land is on high ground with good percolation and slow runoff, with the remainder being a peat bog. Plaintiff contended that as a direct result of the new storm sewer an increased amount of rainfall is captured and discharged directly onto the peat bog. This discharge resulted in a change in the quality and depth of water in the peat bog so that the property on higher land lost its value as a potential lakefront subdivision, and peat extraction was made more difficult. Defendant contended that plaintiff failed to produce sufficient evidence. Affirming defendant's liability, the Court of Appeals held that a plaintiff in an inverse condemnation suit need only show a decline in property market value and need not prove a substantial injury. Liability for damages may include injury to property not actually taken. (Quarles-Florida)
W78-11343

FLORIDA COASTAL MAPPING ACT.
Fla. Stat. secs. 177.25 through 177.40 (1977).

Descriptors: *Florida, *Mapping, *Coastlines, *Standards, High water mark, Low water mark, Shores, Comprehensive planning, Administration, Research and development, Regulation, Boundaries(Property).

The Florida Coastal Mapping Act authorized the state's Department of Natural Resources (DNR) to: (1) coordinate a comprehensive coastal mapping program; (2) develop permanent records of tidal surveys and maps of the state's coastal areas; and (3) develop uniform specifications and regulations for tidal surveying and coastal mapping. DNR was directed to hold local public hearings on all proposed maps. Subsequently, DNR is to approve proposed maps, with or without amendments, or to withdraw them for further study. As shorelines change, DNR on its own initiative or upon notification of conditions, may authorize the production of revised maps. The Act further mandated that the establishment of local tidal datums and the determination of mean high-water and mean low-water lines shall be made in accordance with standards and procedures specified in the Act and in accordance with supplementary DNR regulations. No new map or survey purporting to establish local tidal datums or to determine the mean high or low-water line shall be admissable as evidence in Florida unless made according to the Act. (Baumbach-Florida)
W78-11344

WATER CONSERVATION COMMISSION.
N.D. Cen. Code Ann. secs. 61-02-01 through 61-02-74 (1960), as amended (Supp. 1977).

Descriptors: *North Dakota, *Legislation, *Water conservation, *Administrative agencies, Water quality control, Permits, Regulation, Law enforcement, Adoption of practices, Water resources development, Project planning.

The North Dakota Water Conservation Commission regulates, supervises, investigates, constructs, maintains and controls any system of works involving: (1) waters within the state; (2) flood control; or (3) water pollution prevention. Specific approval must be obtained from the Commission before any irrigation project or dam of certain size is built. Water rights granted by the State Engineer are subject to the Commission's approval. The powers and duties of the Commission are defined by state statutes. Fourteen sections of the State Water Commission Statute are contained as revised in the 1977 statutory supplement. For example, members of the Commission shall now be compensated while attending meetings at the same daily rate as are members of the legislative council. The Commission may now establish rules and regulations governing local financing of water development projects in which the state participates in cooperation with the United States, with political subdivisions or with local governmental entities. And, the Commission's prior approval is no longer required for the construction of municipal water supply, or municipal and industrial waste discharge facilities. (Baumbach-Florida)
W78-11345

DESKOVICH V. WATER POLICY AND SUPPLY COUNCIL (SANITARY LANDFILL SUBJECT TO AGENCY REGULATION).
157 N.J. Super. 89, 384 A. 2d 534-558 (1978).

Descriptors: *New Jersey, *Permits, *Landfills, *Obstruction of flow, Garbage dumps, Water pollution, Flood routing, Administrative agencies, Regulation, Legislation, Decision making, Adjudication procedure.

Plaintiff appealed a Water Policy and Supply Council (Council) decision which: (1) denied plaintiff a stream encroachment permit for construction of a sanitary landfill; and (2) ordered the removal of fill which had already been placed without the permit. Plaintiff argued that his landfill was not within the regulatory scope of the applicable state statute. He asserted that his landfill was not a 'structure within the ordinary highwater mark of a stream' and that the Council's permit denial, which was predicated on the landfill's effects should flooding occur, was not within the Council's designated concern for 'preserving the channel'. In reversing the Council's determination and remanding it with instructions, the appellate court ruled that the applicable statute did not allow the Council to weigh the effects of proposed structures on local flood capacity. However, under the statute, that part of the landfill which contributed debris to the river was a 'structure within the highwater mark'. Therefore, to the extent that the existing landfill violated that statute or any applicable regulations thereunder, the Council could order removal or repair. (Baumbach-Florida)
W78-11346

PARKING MALL ASSOCIATES V. WATER POLICY AND SUPPLY COUNCIL OF THE DIVISION OF WATER RESOURCES OF THE DEPARTMENT OF ENVIRONMENTAL PROTECTION (ADMINISTRATIVE AGENCY CAN ASSESS TIME LIMITS FOR COMPLIANCE WITH PERMIT CONDITIONS).
157 N.J. Super. 169, 384 A. 2d 857-859 (1978).

Descriptors: *New Jersey, *Permits, *Administrative agencies, *Landfills, Administrative decisions, Water management(Applied), Project planning, Regulation, Decision making, Land development, Flow characteristics, Rivers.

Upon appellant firm's failure to comply with conditions of its conditional permit for landfill placement, respondent Water Policy and Supply Council (Council) rescinded the conditional permit. Council subsequently reinstated the conditional permit and extended the time for compliance. On appeal, appellant asserted that the Council's imposition of the time limit without any additional hearing violated appelant's due process rights. The Council contended that the implied power to limit the time within which conditions placed upon permits must be completed is inherent and necessary for the execise of its statutory powers. Affirming the Council's power to impose such time limits, the appellate court noted that time limits are necessary because the character of water courses changes over time, and the interests of other property owners and the public may similarly change over time. In light of a recent state attorney general's opinion stating that appellant permittee has the right to administratively apply for a time extension, appellant's due process rights had not been violated by the Council's failure to hold a hearing when the extended time limit was set. (Baumbach-Florida)
W78-11347

JOHNSON V. WHITTEN (RESULTING DAMAGE FROM SURFACE WATER DRAINAGE OBSTRUCTION NOT ACTIONABLE).
384 A. 2d 698-702 (Me. 1978).

Descriptors: *Maine, *Surface runoff, *Obstruction to flow, *Damages, Drainage water, Repulsion(Legal aspects), Natural flow doctrine, Relative rights, Barriers, Flood damages, Associated costs, Riddance(Legal aspects).

Plaintiffs upper landowners appealed a trial court decision denying them damages for flooding which allegedly resulted when defendant landowner deposited fill on his own land, thus interfering with and damming the natural drainage from plaintiff's land. In affirming the denial of damages, the appellate court held that: (1) there is no liability arising from the obstruction or diversion of the natural drainage of surface water, even if it damages neighboring property; (2) watercourses, on the other hand, cannot be stopped up or diverted to the injury of other proprietors; (3) the issue of whether defendant property owner impeded a watercourse instead of mere surface water was not open for consideration in this case since it was neither raised in the plaintiff's initial complaint nor tried by implied consent of the parties; and (4) plaintiffs also could not recover damages under a state nuisance statute because the statute was intended to apply to actions relating to navigable waters and not to surface water obstruction cases. (Baumbach-Florida)
W78-11348

UNITED STATES OF AMERICA V. SLADE, INCORPORATED (OWNER OF OIL SPILLING TANKER ASSESSED CIVIL PENALTIES AND CLEANUP COSTS).
447 F. Supp. 638-646 (E.D. Tex. 1978).

Descriptors: *Oil spills, *Damages, *Federal Water Pollution Control Act, *Penalties(Legal), Disasters, Water pollution sources, Associated costs, Cost repayment, Pollution taxes(Charges), Law enforcement, Chemical analysis, Gas chromotography.

The United States brought suit against the owner of a tanker barge for the cost of cleaning up an oil spill. The defendant barge owner denied that the spilled oil was from its barge. In ruling for the government, the court held that the responsibility of the defendant for the oil spill was established by evidence of substantial hull damage to the barge and by gas liquid chromatography tests identifying the spilled oil as that from defendant's barge. By its failure to clean up the oil it spilled defendant became liable to the United States, pursuant to the 1972 Federal Water Pollution Control Act Amendments (FWPCA) for the full cost of cleanup operations. Pursuant to the FWPCA, defendant became liable for an additional civil penalty because of its discharge of a harmful quantity of oil into the

navigable waters of the United States. The FWPCA requires that the penalty shall not be assessed unless the offender is given notice and an opportunity to be heard. Since the defendant in this case neither requested nor attended such a hearing, the court ruled defendant was not denied due process by the assessment of the penalty. (Baumbach-Florida)
W78-11349

BOXILL V. METRAILER (DAMAGES AND INJUNCTIVE RELIEF AWARDED FOR DRAINAGE OBSTRUCTIONS).
358 So. 2d 986-993 (La. Ct. App. 1978).

Descriptors: *Louisiana, *Surface runoff, *Obstruction to flow, *Penalties(Legal), Drainage water, Repulsion(Legal aspects), Natural flow doctrine, Relative rights, Barriers, Flood damages, Associated costs, Damages.

Where two estates are situated so that waters flow naturally from the above situated estate through the below situated estate, a legal duty arises on the lower estate to receive those waters which naturally flow through it. Such a duty is called a 'servitude' and the estate burdened by the servitude is called the subservient estate. The estate benefited by the servitude is the dominant estate. When a servitude to receive naturally flowing waters exists on an estate, its proprietor is not at liberty to raise a dam or otherwise obstruct this natural running of water. In this case, defendant subservient estate owner appealed a judgment compelling him to pay damages to the plaintiff dominant estate owner for defendant's obstruction of natural drainage from the cominant estate onto defendant's subservient estate. The appellate court affirmed the damages award and additionally awarded injunctive relief to the dominant estate owner. In support of the injunctive relief granted, the court cited recent cases establishing that owners of dominant estates will be awarded injunctive relief even though the cost of cure may be substantial, unless a very exceptional situation is presented. (Baumbach-Florida)
W78-11350

CHICAGO, MILWAUKEE, ST. PAUL AND PACIFIC RAILROAD COMPANY V. UNITED STATES (CLEANUP COSTS OF OIL SPILL CAUSED BY BURGLAR RECOVERABLE FROM UNITED STATES).
575 F. 2d 839-843 (Ct. Cl. 1978).

Descriptors: *Reimbursable costs, *Federal Water Pollution Control Act, *Oil spills, Water pollution sources, Water pollution treatment, Cleaning, Associated costs, Cost repayment, Water policy, Non-structural alternatives, Water pollution control.

Oil spilled into a nearby stream when valves to large fuel oil tanks on plaintiff's property were left open during a burglary. Plaintiffs cleaned up the oil spill, then sought to be reimbursed by the United States for the cleanup costs pursuant to the Federal Water Pollution Control Act, (FWPCA). The FWPCA provides for cleanup recovery when a spill is caused solely by the act of a third party. The Government argued that plaintiffs were not entitled to recovery because by failing to deter the break-in they were partially responsible for the spill. In granting plaintiffs recovery the court ruled that plaintiff had taken reasonable precautions to prevent such third party meddling in that: (1) building doors had been barred; (2) oil tank valves were closed and each valve handle had been removed; (3) a perimeter fence and outside lighting had been installed. The government also asserted that plaintiff should not recover because of plaintiff's failure to prepare a Spill Control and Countermeasure Plan as recommended by Federal Regulations. The court found that this factor alone did not show that plaintiff failed to exercise reasonable care. (Baumbach-Florida)
W78-11351

PUGET SOUND GILLNETTERS ASSOCIATION V. UNITED STATES DISTRICT COURT (FISHING RIGHTS APPORTIONED ACCORDING TO INDIAN TREATIES UPHELD).
573 F. 2d 1123-1136 (9th Cir. 1978).

Descriptors: *Washington, *Relative rights, *Fishing, *Treaties, Resource allocation, Indian reservations, Legal aspects, Federal jurisdiction, State jurisdiction, Reservation doctrine, Public rights.

Non-Indian petitioners appealed a District Court apportionment of fishing rights between treaty Indians and non-Indians. In affirming that apportionment, the Court of Appeals held that under the applicable treaties, the state and the Indian tribes stand in similar positions as holders of quasi-sovereign rights in fishery. Comparisons between the number of treaty and non-treaty fishers, or the quantity of fish each category has an opportunity to take, were irrelevant under the law. The treaty tribes had reserved their preexisting rights to fish and they continue as sovereign entities to hold those reserved rights. The non-treaty fishers' right to take fish is purely derivative of the states' sovereign rights to the fish. Thus the non-treaty fishers were bound to take only the state's share of the apportioned fish. Furthermore, the allocation of fishing rights between treaty Indians and non-Indian fish catchers was not a denial of equal protection, since the classification was not an impermissable racial classification, but rather was based upon tribal sovereignty. (Baumbach-Florida)
W78-11352

AVONDALE IRRIGATION DISTRICT V. NORTH IDAHO PROPERTIES, INC. (NON-CONSUMPTIVE WATER RIGHTS RESERVED BY THE FEDERAL GOVERNMENT BUT ONLY FOR SPECIFIC PURPOSES).
577 P. 2d 9-24 (Idaho, 1978).

Descriptors: *Idaho, *Water rights, *National forests, *Competing uses, Irrigation districts, Federal government, Non-consumptive use, Water utilization, Watershed management, Natural flow, Flow, Watersheds(Basins).

These cases--consolidated on appeal--raise common issues concerning federal reserved water rights for non-consumptive use to the natural flow of streams in national forests. In the first action, private parties sought to adjudicate their water rights in three creeks. Defendant United States contended the federal reservation doctrine established its non-consumptive water rights to the entire natural flow of the creeks from the point where they arise in the national forest to their point of exit. The other action consisted of several irrigation districts adjudicating water rights in Hayden Lake and its tributaries. The United States Asserted a reserved non-consumptive right in this action also. Affirming one case and reversing the other, the Idaho Supreme Court held: (1) the national forests were created to preserve a perpetual supply of timber and to protect watersheds and the resultant water flow, so that any non-consumptive water rights reserved by the United States were limited to amounts necessary for those purposes; and (2) if the natural flow ever exceeds the minimum flow necessary for timber management and watershed protection, the United States must quantify its water rights and prove its claim as to the excess. (Quarles-Florida)
W78-11353

MARKIEWICZ V. SALT RIVER VALLEY WATER USERS' ASSOCIATION, (LIABILITY OF ASSOCIATION FOR WATER ESCAPE DAMAGE IS A JURY QUESTION).
576 P. 2d 517-530 (Ariz. Ct. App. 1978).

Descriptors: *Arizona, *Flood damage, *Storm runoff, *Adjudication procedure, Damages, United States, Floods, Diversion, Negligence, Spillways, Canal embankments, Floodgates.

Plaintiffs, Arizona homeowners, sought review of a lower court's grant of a directed verdict for defendants, the Salt River Valley Water Users' Association and Salt River Project Agricultural Improvement and Power District. Plaintiffs suffered severe property damage as a direct result of water escaping from the Arizona Canal which is operated by defendant Association as agent for the District. Defendant Association controls water flow into the Canal, attempting to carry off as much storm runoff as possible. Despite precautions, the capacity of the canal is sometimes exceeded so that it overflows the south bank. To prevent erosion of the canal bank the Association installed spillways in the south bank. Plaintiffs' property was damaged when a storm of unusual severity resulted in several breaks in the south bank. Reversing, the Arizona Court of Appeals held: (1) the Association was not immune from suit; (2) the Association could not be held strictly liable where the diversion could be regarded as a natural feature of the land; and (3) a jury could find the Association's failure to improve the gate as negligence and that such negligence caused at least part of damages. (Quarles-Florida)
W78-11354

MOE V. DIVISION OF STATE LANDS (THE POWER OF THE DIVISION OF STATE LANDS TO GRANT FILL PERMITS FOR SUBMERGED LANDS).
569 P. 2d 675-677 (Or. App. 1977).

Descriptors: *Oregon, *Landfills, *Permits, *Conservation, Navigable waters, Administrative decisions, Industries, Legislation, Water resources, Recreation, Transportation, Fish, Economics, Land reclamation, Fisheries, Land development, Administrative agencies, Habitats, Rivers.

Petitioners sought review of an order of the director of the Division of State Lands granting a permit to fill submerged lands. Petitioners contended that the granting of the permit was contrary to the statutory standards set forth in ORS 541.625. The director granting the issuance of the permit admitted in the order that if sound principles of conservation were applied the permit request should be denied. However, the director insisted that circumstances existed in terms of both money and effort which allowed issuance. Examination of the fact situation revealed that the applicants for the permit were in the process of filling submerged land for the purpose of developing an industrial park. Much of the work had been completed with only twenty acres remaining to be filled when the statute at issue was passed. The permit sought concerned the remaining twenty acres. The Court of Appeals of Oregon held that the director clearly exceeded his authority by issuing the permit. The court found that administrative agencies have only the powers granted to them by statute. Consequently, the permit should not have been issued. (Quarles-Florida)
W78-11355

WETLANDS AND RIPARIAN RIGHTS.
Md. Code Ann. secs. 9-101 through 9-501 (1974), as amended (Supp. 1976).

Descriptors: *Maryland, *Legislation, *Dredging, *Permits, Decision making, State governments, Penalties(Legal), Maps, Administrative agencies, Boundaries(Property), Land development, Regulation, Local governments, Ecology, Wetlands, Legal review, Water law.

Dredge or fill licenses require a hearing in the local subdivision affected. After the hearing, the Board shall determine whether the license is in the best interest of the state. The Board shall take into account ecological, economic, developmental, recreational and aesthetic values in considering each application. Each license shall be written and for consideration, and may contain any terms or

conditions which the Board deems necessary. A hearing may be waived for fill areas less than 300 feet in length and not more than ten feet channelward of the mean high water line. The secretary if charged with delineating the landward boundaries of wetlands and showing the boundaries on maps of each political subdivision. Decisions of the circuit court may be appealed to the Court of Special Appeals. In addition to the administrative penalties provided, violation of regulations under this title are misdemeanors, punishable as provided for by law. Judicial review is limited to an assessment of whether the administrative determination was arbitrary and capricious. (Molloy-Florida)
W78-11356

CHY COMPANY V. STATE WATER RESOURCES CONTROL BOARD (UNEXERCISED RIPARIAN RIGHTS ON SAME PRIORITY AS EXERCISED RIPARIAN RIGHTS).
145 Cal. Rptr. 146-150 (1978).

Descriptors: *California, *Water rights, *Water allocation(Policy), *Riparian rights, Streams, Administrative decisions, Administrative agencies, Water resources, Riparian land, Priorities, Beneficial use, Judicial decisions, Competing uses.

Defendant, California Water Resources Control Board, appealed a trial court decision for plaintiff, riparian claimants. In compliance with the California Water Code a California city filed a petition with the Board for a determination of the rights of various claimants to the waters of the Soquel Creek Stream System. After investigation and hearings the Board determined and allocated the right to various water amounts among the riparian claimants. The claimants objected to the Board's action on the grounds that: (1) the Board lacked power to quantify riparian rights not now being used; (2) the Board erred in placing unexercised riparian rights below appropriative rights; and (3) unexercised riparian rights should be placed on the same priority as exercised riparian rights. After the trial court sustained the riparian claimants' contention in all respects, the Board appealed. Affirming the trial court, and Court of Appeals concluded that the state constitution protects present and future riparian rights from infringement, to the extent that such rights are exercised in a manner which is both reasonable and beneficial and to which riparian land may be adaptable. (Quarles-Florida)
W78-11357

OCEAN DUMPING.
Code of Federal Regulations, Title 40, Parts 220-226, Sections 220.1-226.4 (July 1, 1977). p 470-484.

Descriptors: *Oceans, *Pollution abatement, *Waste disposal, *Legislation, Solid wastes, Sewage, Fisheries, Wastes, Dredging, Permits, Regulation, Federal government.

Federal regulations governing ocean dumping are herein set forth. Procedures and criteria are established for the issuance of permits by the federal Environmental Protection Agency pursuant to this Act. Criteria to be applied by the U.S. Army Corps of Engineers in its review of activities involving the transportation of dredged material for the purpose of ocean dumping is also established. Except as authorized by this Act or permits issued pursuant to it, no person shall transport any material for the purpose of dumping it into ocean waters. The scope of the Act's effect is set forth along with its relationship to international agreements. Several exclusions to the Act are set forth including: fish wastes, to an extent; fisheries resources; vessel propulsion and fixed structures; and emergencies to safeguard life at sea. The categories of permits issued include: (1) general; (2) emergency; (3) interim; (4) research; and (5) permits for incineration at sea. The authority to issue permits is designated as the Administrator. There is some delegation of this power to regional administrators, who also have the authority to review Dredged Material Permits issued by the Corps of Engineers. (Quarles-Florida)
W78-11358

BASIN ELECTRIC POWER COOPERATIVE V. STATE BOARD OF CONTROL (APPROPRIATOR'S RIGHT TO TRANSFER WATER USE DENIED).
578 P. 2d 557-576 (Wyo. 1978).

Descriptors: *Wyoming, *Consumptive use, *Water rights, *Beneficial use, Water utilization, Irrigation, Legislation, Natural use, Appropriation, Return flow, Diversion, Administrative decisions.

The primary issue of these consolidated appeals involved the right to transfer certain historic, closed-basin return flows. The appeals resulted when the State (Wyoming) Board of Controls refused to grant plaintiff appropriator's petition to change the use of acquired water appropriations. Petitioner sought to change the appropriations from agricultural to industrial use. Petitioner contended the amount of water consumptively used--its maximum seasonal entitlement--should be increased by the return flows below the topographic divide. Petitioner bases this contention on the theory that this amount was a necessary part of the irrigation and that it was historically lost to the Laramie River system. The Board concluded that these closed-basins return flows had not been beneficially, consumptively used below the divide and could not be transferred whether or not they return to the system. Affirming the Board's decision, the Wyoming Supreme Court held that water in excess of the amount actually used for irrigation and which had historically gone to waste could not be transferred in use or place of use because the appropriator had no right to such excess water. (Quarles-Florida)
W78-11359

STATE, DEPARTMENT OF ENVIRONMENTAL PROTECTION V. EXXON CORP. (LANDOWNER'S LIABILITY FOR PREVIOUS USE OF THE LAND).
376 A. 2d 1339-1350 (N.J. Super. Ct. 1977).

Descriptors: *Oil, *Water pollution, *Subsurface drainage, *New Jersey, Pollution abatement, Subsurface waters, Groundwater, Oil pollution, Water quality, Federal Water Pollution Control Act, Flow, Legislation, Runoff, Legal aspects, Regulation, Industries, Oil spills, Oil industry.

The State Department of Environmental Protection brought an action for injunctive relief and summary judgment against defendant manufacturing corporation for nuisance and for violation of a state statute proscribing the discharge of petroleum products into waters of the state. The defendant sought dismissal of the complaint. The defendant alleged that prior to its acquisition of the property, previous owners had used the property for the refining, storing and transshipping of oil and that as a result of this use, the soil was saturated with oil. In addition, the defendant alleged that the groundwaters of the area were contaminated before it acquired the land. The Superior Court held that the defendant did not discharge oil into the waters of the state within the meaning of the statute. The court found that the simple ownership of land did not impose strict liability on the defendant since the statute did not eliminate the causation requirement. To hold the defendant liable, the defendant must show both an act and causation. The court then dismissed the action for nuisance holding that defendant's use was not a nuisance and that defendant's failure to remedy the existing spillage was not actionable. (Beamer-Florida)
W78-11360

GENERAL PLAN IMPLEMENTATION: THE GROWTH-PHASING PROGRAM OF SACRAMENTO COUNTY,
California Univ., Davis. Inst. of Governmental Affairs; and California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 6B.
W78-11364

COMPARATIVE ANALYSIS AND CRITIQUE OF THE INSTITUTIONAL FRAMEWORK FOR WATER RESOURCES PLANNING AND MANAGEMENT: CANADA, UNITED STATES, AND MEXICO,
Colorado Univ., Boulder. Dept. of Economics.
C. W. Howe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 108, Price codes: A06 in paper copy, A01 in microfiche. Completion Report, October 1977. 95 p, 3 fig, 5 tab, 34 ref. OWRT C-6116(5214)(1).

Descriptors: *Institutions, Planning, Evaluation, Water law, Organizational structure, Management, *Canada, *United States, *Mexico, *International commissions, *Institutional constraints.

An analytical scheme is established for assisting in the design and evaluation of a country's water planning and management institutions. The framework consists of (1) a taxonomy of the major components of the institutional framework and (2) an evaluation procedure based on performance criteria and design characteristics. The institutional frameworks for Canada, the United States, and Mexico are described, including the relevant international institutions. An assessment of these three countries is then made.
W78-11382

REGIONALIZATION OF WATER MANAGEMENT: A REVOLUTION IN ENGLAND AND WALES,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Engineering.
D. A. Okun.
Applied Science Publishers, Ltd., London, England, 1977, 32 tables, 20 fig, Glossary.

Descriptors: *Capital costs, *Flood protection, *Financing, *Water law, *Water pollution control, *Water quality, *Water management(Applied), Discharges(Water), Effluents, Fisheries, Measurement, Surface drainage, Sewage disposal, Water quality standards, *England, *Wales, Water authorities, Water Act, Water quality management, *Regionalization, Abstractions, Department of the Environment, Water Resources Board, Peak charging.

This historical account of English and Welsh attempts to provide regional water resource management begins with the Water Act of 1945 and ends in 1974 with the complete reorganization of the water supply industry. Water management, prior to 1960, was primarily addressed to problems of meeting water demand the cheapest way possible. Amenity issues were introduced around 1963 with the creation of the Water Resource Board (WRB) under the Water Resources Act (WRA) of 1963. Here, the use of rivers for navigation, the use of reservoirs to regulate river flows, and the use of water for various abstractions and discharges showed the interrelationship of water quality and water quantity with the needs for amenity and recreation. Efforts after 1963 concentrated on consolidation and regionalization of the Water Authorities' (WAs) jurisdictions and controlling water pollution through legally enforceable standards of water purity. Central problems surrounding the implementation of plans to regionalize the Water Authorities were financing pollution control efforts and waste water treatment, and charging equitable rates for the use of water services. Efforts at water supply management in the U.S. are

reviewed and the relevance of reorganization in England and Wales is applied to the situation. (Coan-NC)
W78-11452

FIRST ANNUAL REPORT TO THE CONGRESS OF THE UNITED STATES ON LEVEL B PLANNING.
Water Resources Council, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 111, Price codes: A03 in paper copy, A01 in microfiche. 1973, 35 p, 2 tab, 2 fig.

Descriptors: *Federal Water Pollution Control Act, *Planning, *Water quality, *River basins, *Water resources planning, *Water resources development, Land use, Water supply, Methodology, Boundaries(Surfaces), Priorities, Personnel, River basin commissions, Water Resources Planning Act, Management, *Section 209, *Level B planning, Water Resources Council.

Section 209 of the Federal Water Pollution Control Act Amendments of 1972 mandates the preparation of Level B plans for all regions or river basins in the country. The purpose of this report is to describe an approach for carrying out the 209 Program. The study concludes that because of time constraints it has not been possible in this first report to develop a listing of all studies to be accomplished, to delineate explicitly the areal boundaries of specific studies, to establish priorities among potential study areas, to suggest a sequence for the accomplishment of the studies, or to propose specific funding levels or estimate the personnel requirements of the studies. Furthermore, the priority of studies on a geographic basis cannot be determined until Section 208 planning boundaries are delineated and prioritized. Level B priorities must be linked to Section 208 priorities. Subsequent reports will identify specific areas for Level B studies, recommend priorities, and suggest a time-phased sequence for their accomplishment. The results of studies under the Water Resources Council and River Basin Commission as well as the recommendations of the Governors will be utilized as the basis for establishing priorities. (Nessa-NC)
W78-11458

SECOND ANNUAL REPORT TO THE CONGRESS OF THE UNITED STATES ON LEVEL B (SECTION 209) PLANNING.
Water Resources Council, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 112, Price codes: A02 in paper copy, A01 in microfiche. 1974, 9 p.

Descriptors: *Federal Water Pollution Control Act, *Planning, *Water quality, *River basins, *Water resources planning, Land use, Water supply, Methodology, Boundaries(Surfaces), Priorities, Personnel, River basin commissions, Data, State government, Water Resources Planning Act, Water resources development, Management, *Level B planning, *Section 209, *Implementation, Water Resources Council.

This report describes the new approach to Level B planning (Section 209, Federal Water Pollution Control Act Amendments of 1972) adopted by the Water Resources Council (WRC) on October 17, 1973. The main characteristics of the new Level B approach are that: studies are to address all major issues requiring new and mid-term (15 to 25 years) solutions and are to identify major data gaps, unmet needs, and requirements for additional studies in implementation of Level B plans; states will have a strong participating and leadership role; federal funding will be minimal; states must delineate components of the study objectives that relate to state needs; local, state and federal commitments on water and land resources should not be made without considering the inseparable nature of water quality, water quantity and land management problems; water quality programs will be better integrated and more balanced; land use, coastal zone management and rural area development efforts will be supported; the study is limited to two years; the study will cost approximately $750,000 to $1,000,000; and River Basin Commissions (RBCs), where organized, will fill a leadership role, but states will be expected to be partners in Level B planning and would provide leadership in predetermined geographical and functional areas. (Nessa-NC)
W78-11459

ECONOMIC IMPACT OF FISH TOXICANT REGULATIONS,
Northern Illinois Univ., De Kalb. Loredo Taft Field Campus.
For primary bibliographic entry see Field 6B.
W78-11484

APPROPRIATIVE WATER RIGHTS AND THE EFFICIENT ALLOCATION OF RESOURCES,
Kentucky Univ., Lexington.
H. S. Burness, and J. Quirk.
California Institute of Technology, Division of the Humanities and Social Sciences, Social Science Working Paper No. 157, April 1977. 32 p, 8 ref. EX-76-G-03-1305.

Descriptors: *Resource allocation, *Water law, *Water rights, *Appropriative doctrine, *Economic efficiency, *Competition, Legal aspects, Riparian rights, Rivers, Lakes, Surface waters, Priorities, Equilibrium, Economics, Consumptive use, Beneficial use.

In absence of a competitive market for the purchase and sale of water rights the appropriative doctrine leads to inefficient water use. Inefficiency results from unequal sharing of risks among waterway users; senior appropriators bear less risk than junior appropriators. Whereas introduction of a competitive market in water rights and use of diversion facilities eliminates allocative inefficiencies, increasing returns in construction and maintenance of diversion facilities interferes with establishment of competitive markets in leasing diversion capacity, and monopoly problems can arise in the market for water rights as well. Limitations on entry can lead to further problems associated with a suboptimal investment in diversion capacity. In general eastern states rely on the riparian doctrine as the basis for water law, while western states have adopted the appropriative doctrine. Under the former, each property owner fronting on a lake or stream has a right to unimpaired use of the waterway; rights are only usufructuary, and severe restrictions are placed on 'reasonable' diversions. Under the appropriative doctrine the right to a certain amount of water is established and maintained only through use; water rights can be lost through usage lapse or change in the nature of usage. The right enables the holder to physically consume the water in beneficial use. Rights seniority is based on chronological order. (Lynch-Wisconsin)
W78-11504

FEDERAL-STATE WATER USE RELATIONS IN THE AMERICAN WEST: AN EVOLUTIONARY GUIDE TO FUTURE EQUILIBRIUM,
Arizona. Univ., Tucson. Office of Arid Lands Studies.
M. H. Jamail, J. R. McCain, and S. J. Ullery.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 309, Price codes: A08 in paper copy, A01 in microfiche. Arid Lands Resource Information Paper, No. 11. June 1978. 155 p, 166 refs. OWRT W-245(7819)(1).

Descriptors: Colorado River, Colorado River Basin, Federal-state water rights conflicts, Political aspects, Political constraints, Water resources, Boulder Dam, Water resources development, Colorado river compact, Boulder Canyon Project Act, Federal project policy, Mexican water treaty, Arizona, Colorado, Utah, Nevada, New Mexico, California, Southwest U.S., State jurisdiction, Federal jurisdiction, Reservation doctrine, Water rights, Federal reclamation law, Salinity, Cost repayment, Regulatory politics, Distributive politics, U.S. Bureau of Reclamation, Central Arizona Project, Colorado River Basin Salinity Control Act.

Federal-state relations in the field of water resources development in the Colorado River Basin are examined through a review of the literature. A framework is set out in which water policy development in the states of the Colorado River Basin (Arizona, Colorado, Wyoming, California, Nevada, Utah, and New Mexico) can be explained. Distributive, redistributive, and regulatory politics are defined as the three arenas in which water policy discussions take place. After this model is explained, development of water projects and policies in the Basin is explored. Beginning with the Reclamation Act of 1902, defined as the asis of Federal water policy, the Colorado River Compact, the Boulder Canyon Project Act, the Colorado River Storage Project, the Central Arizona Project, the Mexican Water Treaty of 1944, and the Colorado River Basin Salinity Control Act. The 1977 Carter administration's proposal to take water politics out of the distributive arena is examined and the authors conclude that the administration yielded on most of its proposed reforms to avoid a repetition of the 1977 confrontation with the Congress, and because western states' governors were united in the face of possible Federal encroachment, They point out that although the distributive arena is the one most beneficial to the states, the latter must recognize their dependence on Federal financial resources.
W78-11579

DETERGENT PHOSPHATE BAN.
Environmental Protection Agency, Chicago, IL. Phosphorus Committee.
For primary bibliographic entry see Field 5G.
W78-11581

MILWAUKEE'S LAST STAND - CITY FIGHTS ADVANCED TREATMENT ORDERED IN WATER CLEANUP SUIT.
For primary bibliographic entry see Field 5G.
W78-11792

HOLLAND FIGHTS WATER POLLUTION.
Industrial Engineering, Vol. 10, No. 5, p 42-43, May, 1978.

Descriptors: *Treatment facilities, *Automation, *Computers, *Aeration, *Instrumentation, Measurement, Anaerobic digestion, Odor, Sludge treatment, Flotation, Water quality, Waste water treatment, Municipal wastes.

Several of the Netherlands's 519 waste water treatment plants are described. The Eindhoven plant can treat waste water from a population of 750,000; sewage is transported to the facility through a 27.6 mile-long pipeline. The treatment plant's operatios are controlled by a computer which collects plant data, performs impact and fluctuation calculations, and controls pipe flowsand pumping operations. An underwater plant planned in Rotterdam will discharge fumes through a pipeline to a destructor. A number of plants utilize a patented water-jet aeration treatment system that simultaneously oxygenates and mixes the waste water. The Dutch State Mines have constructed an aeration system to convert organic wastes as well as inorganicnitrogen compounds into nitrogen. An industrial anaerobic digester has been designed by the Central Sugar Works. Some plants employ electro-flotation processes, sludge drying techniques, or sludge fermentation tanks for methane gas production. An

automatic water pollution monitoring network collects data on water quality from a number of sources and issues short- and long-term alarms when quality is below normal. (Lisk-FIRL)
W78-11793

DEVELOPING NATIONS FACE PROBLEMS IN WATER AND WASTEWATER MANAGEMENT,
For primary bibliographic entry see Field 5D.
W78-11796

PROCEEDINGS OF THE FEDERAL INTER-AGENCY SEDIMENTATION CONFERENCE, 1963.
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 2J.
W78-11898

ECONOMIC IMPACT OF PROPOSED AMENDMENT TO WATER POLLUTION REGULATIONS FOR HEXANE EXTRACTABLE MATERIALS, R74-1, 8, 9,
WAPORA, Inc., Charleston, IL.
For primary bibliographic entry see Field 5G.
W78-12010

ENVIRONMENTAL PROTECTION AGENCY VS. ROBERT R. DETERS; FABIAN J. DETERS; MARCELLUS J. DETERS; ALVIN L. DETERS; WILLIAM H. DETERS, JR.; AND NORMA MARIE DETERS WEIMAN.
For primary bibliographic entry see Field 5G.
W78-12091

FEEDLOT RUNOFF CONTROL FROM POINT/NON-POINT SOURCES.
American National Cattlemen's Association.
For primary bibliographic entry see Field 5G.
W78-12097

6F. Nonstructural Alternatives

BIVARIATE PDF FOR FLOOD RISK EVALUATION IN CASE OF UNSTEADY FLOW,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 6A.
W78-11387

SHOULD WE TRY TO MEASURE RISK OR SHOUL WE ASSESS IT IN SOME OTHER WAY,
Waterloo Univ. (Ontario). Dept. of Statistics.
For primary bibliographic entry see Field 6A.
W78-11397

ANNOTATIONS OF SELECTED LITERATURE ON NONSTRUCTURAL FLOOD PLAIN MANAGEMENT MEASURES,
Hydrologic Engineering Center, Davis, CA.
H. J. Owen.
March 1977, 95 p.

Descriptors: *Non-structural alternatives, *Planning, *Bibliographies, *Flood plains, *Management, Land use, Floodproofing, Flood plain zoning, Publications, Abstracts, Water resources planning, Flood plain management, Corps of Engineers.

This document is based on a comprehensive literature review of nonstructural flood plain management measures. Nonstructural measures include flood proofing of structures; land use regulation of potential flood hazard areas and, in some cases, regulation of runoff contributing areas; permanent evacuation from the flood plain of damageable activities; and temporary evacuation and emergency preventive actions based on predetermined preparedness plans. The evaluation process that leads to selection of nonstructural measures requires assessments of more site-specific flood loss reduction components than do the more traditional structural measures. Such assessments must be made with less well known economic, social, institutional, and legal consequences. These annotations will be helpful in determining which publications dealing with nonstructural measures are potentially useful and which are redundant. The report contains an index of various types and aspects of nonstructural measures. This document will assist Corps of Engineers and other water resources planners by reducing the time required for literature search. (Nessa-NC)
W78-11455

FLOOD PLAIN INFORMATION: MANTUA CREEK, GLOUCESTER COUNTY, NEW JERSEY, CHESTNUT BRANCH AND EDWARDS RUN.
Army Engineer District, Philadelphia, PA.
For primary bibliographic entry see Field 4A.
W78-11461

FLOOD PLAIN INFORMATION STUDY: SHENANGO AND MAHONING RIVERS, LAWRENCE COUNTY, PENNSYLVANIA -- SUMMARY REPORT.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-11462

FLOOD PLAIN INFORMATION STUDY: SEWICKLEY CREEK AND JACKS RUN, HEMPFIELD TOWNSHIP, PENNSYLVANIA--SUMMARY REPORT.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-11463

FLOOD PLAIN INFORMATION: WEST FORK RIVER, HARRISON COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-11464

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, CATTARAUGUS COUNTY, NEW YORK.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-11465

FLOOD PLAIN INFORMATION: HOBBLE CREEK, SPRINGVILLE, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-11466

FLOOD PLAIN INFORMATION: LOGAN RIVER, LOGAN, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-11467

FLOOD PLAIN INFORMATION: BLACKSMITH FORK AND SPRING CREEK, MILLVILLE, UTAH.
Army Engineer district, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-11468

SPECIAL FLOOD HAZARD INFORMATION REPORT: NORRIS CREEK AND TRIBUTARIES, ABBEVILLE, SC.
Army Engineer District, Savannah, GA.
For primary bibliographic entry see Field 4A.
W78-11469

INTEGRATING ECOLOGICAL AND SOCIAL CONSIDERATIONS INTO URBAN FLOOD CONTROL PROGRAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
L. D. James, A. C. Benke, and H. L. Ragsdale.
Water Resources Research, Vol 14, No 2, April 1978, p 177-184. 3 fig, 4 tab, 15 ref. OWRT B-082-GA(3). 14-31-0001-4070.

Descriptors: *Flood control, *Floodplains, Ecological aspects, Social aspects, *Urban flood control.

A well-planned flood control program requires integration of diverse sets of information to develop alternative remedial measures for public discussion and selection. Although procedures for the required hydrologic studies, engineering designs, and economic analyses are readily available, procedures for assessing effects on the natural environment and on social aspects are still being developed. This paper illustrates one approach to integrating all this information in comparing alternatives, using the Proctor Creek watershed in Atlanta, Georgia, as an example. The illustration begins with a program such as might be formulated by available planning methodology from hydrologic, economic, and engineering data. The illustration continues with suggestions on how to collect meaningful social suitability data from a questionnaire designed to document public perceptions and preferences, ecological data from natural areas in the floodplain, and data relating the effects of the floodplain land use to the well-being of the community. A procedure for integrating these considerations with the established analyses into alternatives presented for public discussion and decision making is then illustrated. Suggestions are also made on how the selected flood control program can be most successfully implemented.
W78-12014

6G. Ecologic Impact Of Water Development

REFLECTIONS ON WASHINGTON'S COASTAL ZONE MANAGEMENT PROGRAM,
Washington State Dept. of Ecology, Olympia. Shoreline Div.
For primary bibliographic entry see Field 6E.
W78-11313

ENVIRONMENTAL LAW: GOVERNMENTAL SUSPENSION OF OUTER CONTINENTAL SHELF OIL DRILLING OPERATIONS,
For primary bibliographic entry see Field 6E.
W78-11329

ECONOMIC MEASUREMENT OF ENVIRONMENTAL DAMAGE,
Organization for Economic Co-Operation and Development, Paris (France).
K. G. Maler, and R. F. Wyzga.
1976. 151 p. $7.00.

Descriptors: *Environmental effects, *Environmental damage functions, *Environmental economics, Economic impact, *Measurement, *Welfare(Economics), *Planning, Damage functions, Economics, Alternative planning, Decision making, Damages, Methodology, Analytical techniques, Manuals, Social impact, Public health, Amenity, Wildlife.

This handbook covers theoretical and practical aspects of environmental damage functions, which are estimates of the relationship between given levels of environmental quality and monetary estimates of the environmental damage associated with those levels. The conceptual framework is that of standard neoclassical welfare economics; it is assumed that damage to be estimated is that perceived by those who currently suffer the damage.

Monetary damage is defined as the least amount necessary to compensate those who suffer from a change in the environmental quality (i.e., the compensating variation). While neither an exclusive nor a perfect tool, monetary damage estimates are useful for organizing and summarizing information on environmental effects in a way which facilitates national decision-making. The handbook has seven chapters: (1) introduction, (2) damage functions, and the environment, (3) economic fundamentals and definitions, (4) classification of damage, (5) estimation of financial losses, (6) estimation of losses of amenity, and (7) recommendations and conclusions. Types of damage considered include human health, fauna, flora, natural resources, materials, and climate and weather. Several methods of applying monetary values to physical damage are discussed. It is concluded that the direct method gives the best results for most types of financial loss where necessary data are available. (Lynch-Wisconsin)
W78-11488

ENVIRONMENT, INTERNATIONAL TRADE AND WASTE MATERIALS,
Leicester Univ. (England). Public Sector Economics Research Centre.
R. Grace, R. K. Turner, and I. Walter.
Discussion paper No. 76-08, Presented at meeting November 1976, of Southern Economic Association, Atlanta, Georgia. 66 p, 16 fig, 5 tab, 13 ref.

Descriptors: *International trade, *Environmental effects, *Wastes, *Recycling, *Marketing, *Regulation, *Public policy, Prices, Materials, Secondary materials, Developing countries, Raw materials, Export, Marginal return, Waste paper, Water pollution control, Air pollution.

International economic dimensions of recycling are outlined and a conceptual and empirical link is established between national and international markets for secondary materials, using waste paper for illustration. Assuming that international trade in waste products is free and that barriers to knowledge and economic distance are overcome, then international market prices will determine the economics of recycling within a particular country. International prices will tend to encourage recycling in some countries and discourage it in others, but the overall volume of recycling and the stability of markets for recycled materials will be greater with internatonal trade and diversification than without it. International trade allocates secondary materials where their marginal product--and hence prices--is highest, thereby providing economic and environmental gains to both users and suppliers. Other dimensions include: (1) Increased recycling can improve a country's balance of payments, exports of secondary or raw materials, and currency exchange rate. (2) Governmental regulation of basic commodities markets could substantially increase price incentives for recycling, and international commodity price stabilization would benefit the secondary materials sector. (3) Recycling offers an alternative to foreign sources of raw materials. (4) Export controls may yield short-term economic gains, but at potentially significant long-term economic and environmental cost. (Lynch-Wisconsin)
W78-11503

WHAT NORTH SEA OIL MIGHT COST FISHERIES,
Marine Lab., Aberdeen (Scotland).
For primary bibliographic entry see Field 5C.
W78-11721

A 'PEOPLE-COUNTER' FOR UNSURFACED WETLAND FOOTPATHS,
Glasgow Univ., (Scotland). Dept. Geography.
For primary bibliographic entry see Field 4C.
W78-11754

THE CONSERVATION OF WETLAND HABITATS FOR WATER FOWL IN SOUTHERN AFRICA,
Wildlife Society of Southern Africa, Pinetown; and Transvaal Provincial Administration, Pretoria (South Africa). Div. of Nature Conservation.
E. A. Zaloumis, and P. le S. Milstein.
Supplement to African Wildlife. Vol 29. No 1, Autumn, 1975. 11 p, 1 fig, 20 ref.

Descriptors: *Africa, *Wetlands, *Waterfowl, *Marsh management, Ducks, Swans, Geese, Habitats, Floodplains, Marshes, Water level fluctuations, Habitat improvement, Wildlife management, Wildlife, *Southern Africa, Vleis, Refuges.

Due to climatic vagaries, limited size and occurrence of wetlands in Southern Africa, and the nomadic behavior of indigenous waterfowl, waterfowl in Southern Africa are more dependent on these wetlands than is the case in northern regions. South African wetlands are divided into five broad zones: (1) Winter Rainfall Zone wetlands are limited in area, shallow, tend to be brackish or saline, and are generally not very fertile. (2) Occasionally flooded depressions, usually with rich saline and alkaline substrates, provide temporary wetlands in the Arid Zone. (3) Highveld Zone wetlands are chiefly shallow pans and depressions. They are important areas for brooding waterfowl. (4) Tropical zone wetlands are primarily the thousands of square kilometers of shallow lakes, swamps, and floodplains associated with the Zambezi River system. (5) Vast floodplains occur in the East Coast Zone. Artificial wetlands should be undertaken as a prerequisite to the preoposed establishment of an international system of wetland refuges. The survey should follow the proven lines of Project Mar. The major share of the establishment of such a refuge system should fall on state organizations, but complementary assistance could be provided by local authorities, privarte individuals, and syndicates of gamebird hunters. (Stihler-Mass)
W78-11759

THE MUSSEL WATCH,
Scripps Institution of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5A.
W78-11957

7. RESOURCES DATA

7A. Network Design

ILLINOIS DATA CATALOG (PRELIMINARY PRINT).
Illinois Inst. for Environmental Quality, Chicago.
For primary bibliographic entry see Field 7C.
W78-11631

NONCOMPUTER OPTIMIZATION OF SINGLE-SOURCE NETWORKS,
Visvesvaraya Region Coll. of Engineering, Nagpur (India).
For primary bibliographic entry see Field 4A.
W78-12050

7B. Data Acquisition

PRELIMINARY RUNOFF AND STREAMFLOW PREDICTIONS IN THE HUMBOLDT RIVER BASIN BASED ON SNOW DISTRIBUTION MEASUREMENTS FROM SEQUENTIAL SATELLITE IMAGERY,
Nevada Univ. System, Reno. Renewable Natural Resources Div.
For primary bibliographic entry see Field 4A.
W78-11366

THE INVENTORY AND DISTRIBUTION OF WATER AND ASSOCIATED LAND RESOURCES IN THE GARRISON/DEVILS LAKE REGION OF ND: AN APPLICATION OF RESOURCE DATA ACQUIRED BY ERTS,
North Dakota Univ., Grand Forks. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W78-11373

ICE SHEET TOPOGRAPHY BY SATELLITE ALTIMETRY,
EG and G Washington Analytical Services Center, Inc., Rockville, MD.
For primary bibliographic entry see Field 2C.
W78-11422

GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA, REPORT,
Colorado School of Mines, Golden, Dept. of Geology.
For primary bibliographic entry see Field 7C.
W78-11439

EARTH RESOURCES DATA ACQUISITION SENSOR STUDY, PERIOD: DECEMBER 1, 1974-MAY 31, 1975,
Alabama Univ., Huntsville. School of Graduate Studies and Research.
For primary bibliographic entry see Field 5A.
W78-11443

CALIBRATION OF SELECTED INFILTRATION EQUATIONS FOR THE GEORGIA COASTAL PLAIN,
Agricultural Research Service, Beltsville, MD. Plant Physiology Inst.
For primary bibliographic entry see Field 2G.
W78-11449

REMOTE SENSING OF AQUATIC PLANTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
L. E. Link, Jr., and K. S. Long.
In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 269-288, 8 fig, 4 tab, 4 ref.

Descriptors: *Remote sensing, *Aquatic weed control, *Mapping, *Monitoring, *Measurement, *Aerial photography, *Aquatic Plant Control Program, Aquatic plants, Species composition, Multispectral scanners, Side-looking radar, Thermal scanners, Infrared radiation, Model studies, Lakes, Reservoirs, Louisiana, Mississippi, South Carolina, Satellites, Films, Water hyacinth, Hydrilla verticillata, Egeria densa, Duckweed, Eutrophication, Water pollution effects.

Use of remote sensor systems for mapping the distribution and character of aquatic plants for control purposes is under study at the U.S. Army Engineer Waterways Experiment Station. The project covers: (1) problem definition, (2) literature review, (3) systems description, (4) model studies, and (5) field studies. Remote sensor imagery includes spectral properties (image tones), pattern properties (groupings of image tones), and association properties (knowledge of the site on the part of the interpreter). Basic types of remote sensing systems are: (1) aerial photography, including multispectral scanners; (2) thermal-infrared systems; and (3) radar or microwave systems (side-looking radar). Aerial photography, Landsat multispectral scanners, and side-looking radar systems appear to offer the greatest potential; thermal-IR sensors are probably the least useful. A computerized mathematical model of relationships between photographic remote sensors and environmental

factors was developed to evaluate performance of various filmlfilter combinations. An example of output is given. Several field studies to verify model predictions and acquire information on extent and composition of aquatic plant species were conducted April-September 1976 at: (1) Lake Boeuf, Louisiana; (2) Lake Theriot, Louisiana; (3) Ross Barnett Reservoir, Mississippi; and (4) Santee-Cooper Reservoir (Lake Marion), South Carolina. Future studies are described. (See also W78-11591) (Lynch-Wisconsin)
W78-11621

COMPARISON OF MANUAL (GRAB) AND VACUUM TYPE AUTOMATIC SAMPLING TECHNIQUES ON AN INDIVIDUAL AND COMPOSITE SAMPLE BASIS.
National Fielld Investigations Center-Denver, CO. Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 633, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA/330/1-74/001, September 1974. 40 p, 2 fig, 5 tab, 2 append.

Descriptors: *Sampling, *Research equipment, *Grab samplers, *Automatic samplers, *SERCO automatic samplers, *Monitoring, Performance, Vacuum automatic samplers, Methodology, Waste water treatment, Water quality control, Water pollution control, Automatic control, Manual control, Suspended solids.

Comparison of a manual grab sampler with a SERCO vacuum-type automatic sampler showed the two were equivalent on a composite sample basis, but not on an individual grab sample basis. Comparisons were made using total solids, total suspended solids, and volatile suspended solids at a wastewater treatment plant. Samples collected manually were lower in concentration than automatic samples on an individual grab sample basis, but it was not possible to determine which sampling method reflected true wastewater conditions. The positioning of the probe on the SERCO sampler (upstream, downstream, or lateral) did not affect results, with one exception: the upstream vs the lateral positions were not equivalent for volatile suspended solids in individual grab samples. It was concluded that this parameter was not satisfactory for the statistical comparison. Sample collection frequency on a composite basis over a six-hour period was not significant; samples collected every 15 min were compared with samples collected hourly. Since it was possible that solids could vary with depth, and the automatic sampler collects at depth while the manual sampler collections include surface sampling, a special manual sampler was constructed to collect at the same depth as the automatic sampler. The special sampler yielded results equal to the manual sampler in all comparisons. (Lynch-Wisconsin)
W78-11630

IMPROVED PLANKTON NET BUCKET,
Nalco Environmental Sciences, Northbrook, IL.
G. F. Carpenter.
The Progressive Fish Culturist, Vol 40, No 2, p. 8, 1978. 1 fig.

Descriptors: *Plankton, Zooplankton, Phytoplankton, *On-site investigations, *Surveys, Laboratory equipment, Nets, *Methodology, Sampling, *Plankton net bucket, Plankton nets.

A plankton net bucket for environmental studies is described. This design overcomes many of the deficiencies of other designs. (EIS-Katz)
W78-11727

SUBMERGED PERIPHYTON SAMPLER,
Virginia State Water Control Board, Richmond.
R. W. Ayers, and D. H. Treacy.
The Pregressive Fish Culturist, Vol 40, No 2, p. 81, 1978. 1 fig, 2 ref.

Descriptors: *Algae, On-site investigations, *Periphyton, Monitoring, Laboratory equipment, *Methodology, Sampling, Benthos, Submerged periphyton sampler.

A submerged periphyton sampler that is suitable for use in streams is described. It is a desirable alternative to floating type periphyton samplers. (EIS-Katz)
W78-11728

FUNNEL TRAP FOR COLLECTING LITTORAL AQUATIC INVERTEBRATES,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
G. A. Swanson.
The Progressive Fish Culturist, Vol 40, No 2, p. 73, 1978. 1 fig, 3 ref.

Descriptors: *Aquatic insects, *Laboratory equipment, *Benthos, Invertebrates, On-site investigations, Crustaceans, Zooplankton, Fish food organisms, *Methodology, *Littoral aquatic invertebrates, Insect trap, Funnel trap.

A funnel trap is described that collects littoral aquatic invertebrates without gathering detritus. In the vertical position it is quantitative. (EIS-Katz)
W78-11734

LOW-COST, LARGE-VOLUME AIR SUPPLY FOR EXPERIMENTAL TANKS,
Ohio State Univ., Columbus. Museum of Zoology.
R. Crunkilton, and W. LeGrande.
The Progressive Fish Culturist, Vol 40, No 2, p. 75-76, 1978.

Descriptors: *Laboratory equipment, *Methodology, Laboratory techniques, *Laboratories, Aeration, Aquaria, Pumping, Pumps, Dissolved oxygen, Oxygenation.

A low-cost, large-volume air blower to supply aeration to a large number of experimental tanks is described. (EIS-Katz)
W78-11736

FLOW-THROUGH COLLECTION BUCKET FOR LARVAL FISH,
Tennessee Valley Authority, Norris. Div. of Forestry, Fish and Wildlife Development.
L. F. Graser.
The Progressive Fish Culturist, Vol 40, No 2, p 78-79, 1978. 1 fig, 1 tab, 8 ref.

Descriptors: *Juvenile fish, Juvenile growth stage, Freshwater fish, *On-site investigations, *Surveys, Laboratory equipment, Zooplankton, Nets, Methology, Sampling, *Collection bucket, *Larval fish.

A flow-through collector for larval fish is described. The collector minimizes damage to larva during collection and handling, allows thorough washing to ensure complete removal of all fishes, provides quick and secure attachment to and removal from net, provides ready access for efficient removal of detritus and weeds an is economical and simple to construct from commonly available materials. (EIS-Katz)
W78-11746

ORGANIC CONTAMINANTS IN WATER.
For primary bibliographic entry see Field 5A.
W78-11757

DIRECT ANALYTICAL PROCEDURE FOR DETERMINATION OF VOLATILE ORGANIC ACIDS IN RAW MUNICIPAL WASTEWATER,
Technion-Israel Inst. of Tech., Haifa. Environmental Engineering Lab.
For primary bibliographic entry see Field 5A.
W78-11836

COMPUTER CONTROL SYSTEM FOR WATER AND WASTEWATER TREATMENT PLANTS,
Hitachi Ltd. (Japan).
M. Kashiwagi, S. Mori, and T. Harada.
Hitachi Review, Vol 27, No 3, p 146-152, 1978. 10 fig, 7 ref.

Descriptors: *Analog computers, *Digital computers, *Data storage and retrieval, *Instrumentation, *Control systems, Optimization, Computer models, Data processing, Programming languages, Treatment facilities, Automation, Supervisory control(Power), Electronic equipment, Waste water treatment, Municipal wastes.

Hitachi, Ltd., of Japan has developed the AQUAMAX-80 computer control series and AQUADIC, the supervisory control computer subsystem, for use in water and waste water treatment plants. The AQUAMAX-80 series permits shifts from centralized to distributed systems, from hardware to software systems, and from simple to total or optimum control; it provides continued localized control in the event of supervisory system shut-down. Three models are available in the series. The A analog control model for small plants has a graphic panel which provides cathode-ray tube (CRT) display for plant monitoring and data logging. The C model offers microcomputerized control, light emitting diode display (LED), CRT, and a high-speed telemeter and telecontrol system (signal transmission unit). The computerized supervisory F system provides CRT and LED display, high-speed data transmission, and optimum operation and prediction controls. All series are equipped with Hitachi's telemetry system, data concentrating boards, and motor control centers. The AQUADIC system provides: a data base for analog, fault, and other information; standard programs for water and waste water treatment plants; analog, digital, and pulse input; digital and analog output; CRT formats; sequential fill-in-the-form logging; and an automatic reports generator. The color CRT and special keyboard provide the operator-machine interface for displaying equipment, instrument, and piping details. A typical computerized dissolved oxygen control system designed for an activated sludge plant provides feedback and feed forward control, nonlinear compensation for valve position-air flow rate, and feedback valve position compensation. (Lisk-FIRL)
W78-11843

SUBSURFACE CAVITY DETECTION: FIELD EVALUATION OF RADAR, GRAVITY, AND EARTH RESISTIVITY METHODS,
Southwest Research Inst., San Antonio, TX.
L. S. Fountain.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification; Transportation Reserch Record 612, Transportation Record Board National Academy of Sciences, Washington, D.C., p 38-46, 1976. 7 fig, 14 ref.

Descriptors: *Geophysics, *Exploration, *On-site tests, *Subsurface investigations, *Florida, *Alabama, Surveys, Subsidence, Radar, Instrumentation, Resistivity, Gravity studies, Gravity, Gravimeters, Methodology, Evaluation, On-site investigations, Caves, Earth resistivity, Ground penetrating radar.

Graity, ground-penetrating radar, and earth resistivity profiling as subsurface cavity detection methods were evaluated experimenally and compared in three geological environments. Verification test showed that the gravity measurements located large carvernous areas but did not detect mud-filled troughs; the radar detected air-filled cavities at depths up to 4.6 m (15 ft) at one site, but only penetrated 3 m (10 ft) with inconclusive results at a second site, and could not resolve 0.6-m (2 ft) diameter vertical cylindrical cavities at another. Earth resitivity measurements using a pole-dipole electrode arrangement located cavities

at all sites, indicating targets at depths up to 25 m (80ft). Both air-filled cavities, including vertical cyclinders, and mus-filled troughs were detected by using the resistivity technique, which gave accurate depth and size resolution. A large mud-filled trough was detected at a 90m (30-ft) depth that extended below 30.5 m (100 ft). The earth resistivity technique was capable of delineating the irregularities of the bedrock at the soil-rock interface. (See also W78-11865) (Humphreys-ISWS).
W78-11871

COMPARISON OF THE RADIOACTIVE AND MODIFIED TECHNIQUES FOR MEASUREMENT OF STREAM REAERATION COEFFICIENTS,
Geological Survey, Bay St. Louis, MS. Water Resources Div. and Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-11977

ELUTRIATOR/MICROCOSM SYSTEM PILOT MODEL AND TEST,
Naval Ocean Systems Center, Kailua, HI.
For primary bibliographic entry see Field 5C.
W78-12000

7C. Evaluation, Processing and Publication

DEVELOPMENT OF A REGIONAL INFORMATION SYSTEM FOR HYDROLOGIC MODELING,
Maryland Univ. College Park. Dept. of Civil Engineering.
J. D. Fellows, and R. M. Ragan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 112, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Center, University of Maryland, College Park, Technical Report No. 46, 1978. 21 p, 13 fig, 2 tab, 2 ref. OWRT A-039-Md(1), 14-34-0001-7044.

Descriptors: Hydrology, *Urban hydrology, Hydrologic modeling, Water resources, Planning, *Regional analysis, *Model studies, *Information systems.

Many of the models used in the water resources decision making process require parameters that are defined in terms of geomorphic (e.g. land cover, soils, etc.) characteristics of the watershed. When large areas are involved it is difficult and time consuming to develop a quantitative measure of the needed information. Methods are needed to encode and store this information in a computerized data base that can be easily accessed on a watershed basis. A hydrologic data management system was developed and used to transform soil map information into a georeferenced digital data base format stored on a disc file. The data management system was designed for planning groups that need a jurisdictional wide information base. Such groups would require frequent utilization of the one time encoded data base.
W78-11379

INTERNATIONAL SYMPOSIUM ON RISK AND RELIABILITY IN WATER RESOURCES.
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-11386

BIVARIATE PDF FOR FLOOD RISK EVALUATION IN CASE OF UNSTEADY FLOW,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 6A.
W78-11387

DIRECTIONS OF SECURITY FOR THE OPERATION OF A HYDROELECTRIC POWER STATION WITH NON STEADY FLOW, (ARTICLE IN FRENCH),
Quebec Dept. of Natural Resources Water General Management.
For primary bibliographic entry see Field 8C.
W78-11413

THE RELIABILITY OF SAND DEWATERING BEDS FOR SLUDGE MEASURED BY THE PERFORMANCE INDEX,
Clark (Edward E.), Miami, FL.
For primary bibliographic entry see Field 5D.
W78-11415

ANALYSIS OF HYDROLOGIC DATA USING PEARSON TYPE III DISTRIBUTION,
Central Water and Power Research Station, Poona (India).
For primary bibliographic entry see Field 2E.
W78-11423

GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA, REPORT,
Colorado School of Mines, Golden, Dept. of Geology.
K. Lee, G. L. Prost, D. H. Knepper, D. L. Sawatsky, and D. Huntley.
Available from the National Techical Information Service, Springfield, VA 22161 as N76-28593, Price codes: A00 in paper copy, A01 in microfiche. Final Report, Remote Sensing Report 75-7, December 1975. 320 p, 78 fig, 12 tab, 38 ref, 9 append. NASA NAS9-13394.

Descriptors: *Remote sensing, *Geology, *Mineralogy, *Water resources, *Satellites(Artificial), *Colorado, Photography, Data processing, Mapping, Surveys, Petrology, Mining, Surface waters, Groundwater, Hydrogeology, Evaluation, Analytical techniques, Skylab.

Skylab photographs are superior to ERTS images for photogeologic interpretation primarily because of improved resolution. Similarly, S190B photos provide more geologic advantage over good color photography; S190B stereo color photos, where available, provide maximum geologic information. All major geologic structures can be recognized on Skylab photographs. Large folds, even those with very gentle flexures, can be mapped accurately and with confidence. Bedding attitudes of only a few degrees are recognized. Mineral deposits in Central Colorado may be indicated on Skylab photos by lineaments and color anomalies, but positive identification of these features is not possible. Water resource studies can use Skylab photography for interpretation of drainage, hydrogeology, and groundwater flow. S190A stereo color photography is adequate for defining drainage divides that in turn define the boundaries and distribution of groundwater recharge and discharge areas within a basin. Skylab S190B stereo photography has sufficient resolution to map hydrogeologic units and structures that may be sufficient for regional studies. Aircraft photography and field work are still necessary to produce an accurate hydrogeologic map. (Sims-ISWS)
W78-11439

LAKE ONTARIO ATLAS: INTERNAL WAVES,
New York Sea Grant Inst., Albany.
For primary bibliographic entry see Field 2H.
W78-11448

FLOOD PLAIN INFORMATION: MANTUA CREEK, GLOUCESTER COUNTY, NEW JERSEY, CHESTNUT BRANCH AND EDWARDS RUN.
Army Engineer District, Philadelphia, PA.
For primary bibliographic entry see Field 4A.
W78-11461

FLOOD PLAIN INFORMATION STUDY: SHENANGO AND MAHONING RIVERS, LAWRENCE COUNTY, PENNSYLVANIA -- SUMMARY REPORT.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-11462

FLOOD PLAIN INFORMATION STUDY: SEWICKLEY CREEK AND JACKS RUN, HEMPFIELD TOWNSHIP, PENNSYLVANIA--SUMMARY REPORT.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-11463

FLOOD PLAIN INFORMATION: WEST FORK RIVER, HARRISON COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-11464

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, CATTARAUGUS COUNTY, NEW YORK.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-11465

FLOOD PLAIN INFORMATION: HOBBLE CREEK, SPRINGVILLE, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-11466

FLOOD PLAIN INFORMATION: LOGAN RIVER, LOGAN, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-11467

FLOOD PLAIN INFORMATION: BLACKSMITH FORK AND SPRING CREEK, MILLVILLE, UTAH.
Army Engineer district, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-11468

SPECIAL FLOOD HAZARD INFORMATION REPORT: NORRIS CREEK AND TRIBUTARIES, ABBEVILLE, SC.
Army Engineer District, Savannah, GA.
For primary bibliographic entry see Field 4A.
W78-11469

HYDROLOGIC INVENTORY AND EVALUATION OF NEVADA PLAYAS,
Nevada System Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2H.
W78-11573

AUTOMATED PROCESSING OF APC FIELD OPERATIONS DATA,
Army Engineer District, Jacksonville, FL.
For primary bibliographic entry see Field 5G.
W78-11604

DATA MANAGEMENT SYSTEMS IN THE AQUATIC PLANT CONTROL RESEARCH PROGRAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
J. A. Parks.

In: Miscellaneous Paper A-77-3, August 1977. Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 19-22 October 1976, Atlantic Beach, Florida. p 289-298, 10 fig.

Descriptors: *Data processing, *Aquatic weed control, *Lake Conway(FL), *Lake Concordia(LA), *Stocking, *Harvesting, *Aquatic Plant Control Program, White amur, Ctenopharyngodon idella, Florida, Louisiana, Water hyacinth, Eichhornia crassipes, Model studies, Lakes, Mechanical control, Biocontrol, Data storage and retrieval, Data collections, Aqua-Trio, Eutrophication, Water pollution effects.

Data management systems developed for each of four research projects of the U.S. Army Engineers Aquatic Plant Control Research Program are described. The projects are: (1) Lake Conway, Florida, white amur fish stocking test; (2) Lake Concordia, Louisiana, water hyacinth biological control experiments; (3) white amur stocking rate model (connected with the Lake Conway project); and (4) mechanical plant harvesting component of the Aqua-Trio system. The three major elements in a data management system are collection, storage, and retrieval/display. A workable system should encompass five factors: precision, correct form, completeness, timeliness (scheduling), and adequate identification. Each current project is described, with illustrations of system design. The Lake Conway project required a system able to respond to data demands from many sources and simultaneously provide information pertinent to particular aquatic plant problems. Strong lines of communication among contractors, data coordinator, and users were essential. At Lake Concordia the scope of the test was very limited, and data demands less complex than at Lake Conway. The white amur stocking rate model required two-phased data management dealing with: (1) data as input for model formulation, and (2) data produced. The mechanical plant harvesting project is a time-dependent operation; data on each load from pickup to disposal can be displayed as tables or charts, and compared and analyzed. (See also W78-11591) (Lynch-Wisconsin)
W78-11622

ILLINOIS DATA CATALOG (PRELIMINARY PRINT).
Illinois Inst. for Environmental Quality, Chicago.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 682, Price codes: A11 in paper copy, A01 in microfiche. June 1972, IIEQ Document No DB-1. 231 p.

Descriptors: *Illinois, *Data collections, *Information exchange, *Information retrieval, *Planning, *Catalogs, Water resources, Air resources, Human resources, Land resources, Publications, Environmental impact, Maps.

A catalog of 212 collections of Illinois data is specifically geared to needs of environmental planning. The scope of this first edition is limited to data files regularly updated by state agencies, and does not include files produced by federal, local, or private organizations. Emphasis is on statewide rather than local data. The catalog is also limited to mappable data; information pertaining to general aspects of the state is not included. Data which has lost its geographic character is likewise not included, and raw or unprocessed data files are emphasized. Entries are arranged by subject within four classifications: (1) human resources, (2) land resources, (3) water resources, and (4) air resources. For each entry the data type, geographic area covered, and update frequency are followed by a narrative description of the contents of the data file, origin of the information, and references to publications based on the data. An address for ordering publications is given, and accessibility restrictions are noted. A guide to more complete information is provided, as well as the name, address, and telephone number of the agency and person having custody of the data. Indices of agencies and subjects are included. (Lynch-Wisconsin)
W78-11631

MAPS SHOWING GROUND-WATER CONDITIONS IN THE WILLCOX AREA, COCHISE AND GRAHAM COUNTIES, ARIZONA--1975,
Geological Survey, Tucson, AZ. Water Resources Div.
L. J. Mann, N. D. White, and R. P. Wilson.
Water Resources Investigations 78-60 (open-file report), April 1978. 3 sheets, 8 ref.

Descriptors: *Maps, *Groundwater, *Water wells, *Water levels, *Water quality, Dissolved solids, Fluoride, Aquifers, Hydrographs, Water level fluctuations, Pumping, Water yield, *Arizona, *Willcox area(Ariz), Cochise County, Graham County.

The Willcox area includes about 1,500 square miles in southeastern Arizona. The main use of ground water is for irrigation. For 1954-75, the estimated ground-water pumpage exceeded 100,000 acre-feet per year, and for 1967-75, ground-water pumpage averaged about 300,000 acre-feet per year. Ground-water withdrawals have resulted in general water-level declines in most of the developed part of the area. Information shown on the maps includes change in water level (1963-75), irrigated area, depth to water, well depth, altitude of the water level, and distribution of dissolved solids and fluoride. Hydrographs of water levels in selected wells and a table of historical pumpage are included also. (Woodard-USGS)
W78-11967

MAPS SHOWING GROUND-WATER CONDITIONS IN THE YUMA AREA, YUMA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, AZ. Water Resources Div.
D. W. Wilkins.
Water-Resources Investigations 78-62 (open-file report), April 1978. 3 sheets, 6 ref.

Descriptors: *Maps, *Groundwater, *Saturated soils, *Drainage wells, *Pumping, Water wells, Irrigation, Water levels, Water quality, Specific conductivity, Fluorides, *Arizona, Yuma County.

In the Yuma area, Arizona, ground water is pumped mainly for the drainage of waterlogged land and for irrigation. In 1975 about 255,000 acre-feet of ground water was withdrawn, of which about 158,000 acre-feet was pumped for drainage of waterlogged land. For 1915-75, about 4,568,000 acre-feet was withdrawn, of which 2,387,000 acre-feet was pumped for drainage. Information shown on maps includes change in water level (1970-75) and irrigated area; depth to water and altitude of the water level; and specific conductance and fluoride concentration. A table of historical pumpage is included. (Woodard-USGS)
W78-11968

MAPS SHOWING GROUND-WATER CONDITIONS IN THE EASTERN PART OF THE SALT RIVER VALLEY AREA, MARICOPA AND PINAL COUNTIES, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
R. L. Laney, P. P. Ross, and G. R. Littin.
Water-Resources Investigations 78-61 (open-file report), April 1978. 2 sheets, 14 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water wells, *Water levels, *Water quality, Water utilization, Irrigation, Water level fluctuations, Maps, *Arizona, *Salt River Valley area(Ariz), Maricopa County, Pinal County.

In 1976 about 1.68 million acre-feet of ground water was pumped in the Salt River Valley, Ariz. Since 1923, more than 73 million acre-feet has been withdrawn, which has resulted in a general decline in water levels. Water levels in the eastern part of the Salt River Valley area have declined as much as 420 feet. Information on the maps includes altitude of the water level, depth to water, change in water level (1923-76), and irrigated area. Hydrographs of the water level in selected wells, a table of historical pumpage, and a brief discussion of the chemical quality of the ground water are included also. (Woodard-USGS)
W78-11969

MAPS SHOWING GROUND-WATER CONDITIONS IN THE WESTERN PART OF THE SALT RIVER VALLEY AREA, MARICOPA COUNTY, ARIZONA--1977,
Geological Survey, Tucson, AZ. Water Resources Div.
P. P. Ross.
Water-Resources Investigations 78-40 (open-file report), March 1978. 2 sheets, 18 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water wells, *Water levels, *Water quality, Water utilization, Irrigation, Water level fluctuations, Maps, *Arizona, *Salt River Valley area, Maricopa County.

In 1976 about 1.68 million acre-feet of ground water was pumped in the Salt River Valley. Since 1923, more than 73 million acre-feet has been withdrawn, which has resulted in a general decline in water levels. Water levels in the western part of the Salt River Valley area have declined as much as 350 feet. Information on the maps includes altitude of the water level, depth to water, change in water level (1923-77), and irrigated area. Long-term hydrographs of the water level in selected wells, a table of historical pumpage, and a brief discussion of the chemical quality of the ground water are included also. (Woodard-USGS)
W78-11970

AVAILABILITY OF GROUND WATER IN THE PISCATAQUA AND OTHER COASTAL RIVER BASINS, SOUTHEASTERN NEW HAMPSHIRE,
Geological Survey, Concord, NH. Water Resources Div.
J. E. Cotton.
Water-Resources Investigations 77-70 (open-file report), 1977. 1 sheet, 7 ref.

Descriptors: *Groundwater resources, *Groundwater availability, *Aquifers, *Coastal Plains, *New Hampshire, *Maps, Water wells, Water yield, Water quality.

This map (scale 1:125,000) is a preliminary assessment of the availability of ground water in the Piscataqua and coastal river basins in New Hampshire. It is a generalization of several hydrogeologic factors and provides a guide for ground-water exploration, which is useful in water- and land-use planning. The best aquifers in the basin are deposits of stratified sand or sand and gravel of Pleistocene age. Large aquifers of this type occur in places in the major river valleys and in interstream areas within the coastal plain. Ground water is generally of good chemical quality. Iron and manganese in concentrations greater than the recommended limits for drinking water suggested by the U.S. Public Health Service, however, are not uncommon. (Woodard-USGS)
W78-11971

FLOODS IN WESTERN NORTH CAROLINA, NOVEMBER 1977 - A LESSON FOR THE FUTURE,
North Carolina Water Resources Research Inst., Raleigh; Geological Survey, Raleigh. Water Resources Div.; and North Carolina Dept. of Natural Resources and Community Development, Raleigh.
For primary bibliographic entry see Field 2E.
W78-11973

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 3A: SOUTHWEST FLORIDA - SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 715, Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report FL-77-3A, May 1978. 613 p, 12 fig, 1 tab, 48 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Elevation, Lakes, Reservoirs, Data collections, Sites, *Southwest Florida.

Water resources data for the 1977 water year in Florida consist of discharge records for 271 streams, stage-only records for 223 streams, elevations for 228 lakes, 66 crest-stage partial records, and water level measurements for 828 wells. Water quality data for approximately 680 surface sites and 930 wells are included. The data in this volume for southwest Florida include discharge records for 93 streams, stage-only records for 24 streams, elevations for 109 lakes, miscellaneous measurements, crest-stage partial records for 14 streams, and water quality data for approximately 315 surface water sites. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W78-11974

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 3B: SOUTHWEST FLORIDA - GROUND WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 529, Price codes: A24 in paper copy, A01 in microfiche. Water-Data Report FL-77-3B, May 1978. 596 p, 19 fig, 1 tab, 49 ref.

Descriptors: *Florida, *Hydrologic data, *Groundwater, *Water quality, Water analysis, Water temperature, Chemical analysis, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year in Florida consist of discharge records for 271 streams, stage-only records for 223 streams, elevations for 228 lakes, 66 crest-stage partial records, and water level measurements for 828 wells. Water quality data for approximately 680 surface sites and 930 wells are included. The data in this volume for southwest Florida include water level measurements for 828 wells and water quality data for approximately 500 wells. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W78-11975

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1977--VOLUME 4: NORTHWEST FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 768, Price codes: A23 in paper copy, A01 in microfiche. Water-Data Report FL-77-4, June 1978. 573 p, 46 fig, 1 tab, 48 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Northwest Florida.

Water resources data for the 1977 water year in Florida consist of discharge records for 84 streams, stage only records for 223 streams, elevations for 228 lakes, water level measurements for 828 wells, and crest-stage partial records for 66 streams. Water quality data for approximately 605 streams and 932 wells are included. The data in this report for northwest Florida include discharge records for 61 streams, stage only records for 46 streams, elevations for 27 lakes, water level measurements for 131 wells, crest-stage partial records for 29 streams, water quality data for 35 streams and 151 wells. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W78-11976

WATER-QUALITY RECORDS FOR THE HUBBARD CREEK WATERSHED, TEXAS, OCTOBER 1974 - SEPTEMBER 1976,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-11981

SELECTED HYDROLOGIC DATA, CAMAS PRAIRIE, SOUTH-CENTRAL IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
H. W. Young, R. L. Backsen, and K. S. Kenyon.
Open-file report 78-500, July 1978. 70 p, 4 fig, 5 tab.

Descriptors: *Hydrologic data, *Groundwater, *Surface waters, *Water quality, *Basic data collections, Aquifer characteristics, Drillers logs, Water wells, Water levels, Hydrographs, Streamflow, Flow rates, Water analysis, Chemical analysis, *Idaho, *Camas Prairie(Idaho).

This report presents data collected during a 1-year study of the water resources of Camas Prairie, Idaho. Included are records of wells, discharge measurements of streams, hydrographs of water levels in wells, water-quality data, and drillers' logs of wells. The data are conveniently made available to supplement an interpretive report, which will be published separately. (Woodard-USGS)
W78-11982

GEOHYDROLOGIC DATA FROM THE JEMEZ MOUNTAINS AND VICINITY, NORTH-CENTRAL NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
F. W. Trainer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 221, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 77-131, January 1978. 146 p, 7 fig, 11 tab, 81 ref.

Descriptors: *Geothermal studies, *Thermal springs, *Hydrogeology, *Energy transfer, *Baseline studies, Powerplants, Data collections, Water temperature, Logging(Recording), Geophysics, Wells, Chemical analysis, New Mexico, *Jemez Mountains, *Rio Grande rift, *Sierra Nacimiento, Los Alamos County, Rio Arriba County, Sandoval County, Santa Fe County.

The Jemez Mountains volcanic region, on the west margin of the Rio Grande rift in north-central New Mexico, is the site of studies for power development from geothermal heat. This report summarizes geohydrologic data to provide background information relative to the geothermal exploration and to investigate the usefulness of hydrology in assessment of the geothermal resource. Eleven tables present chemical, temperature, discharge, and other data for springs, wells, and streams. Accompanying figures show locations of the data points and present temperature profiles and geophysical logs for selected wells. (Woodard-USGS)
W78-11986

FLOOD PROFILES FOR CYPRESS CREEK, WEST-CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
W. R. Murphy, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 128, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 78-8, April 1978. 29 p, 7 fig, 9 tab, 16 ref.

Descriptors: *Flood profiles, *Flood plain zoning, *Floods, *Flood plains, *Flood peak, Planning, Land development, Analytical techniques, Florida, *Cypress Creek, *Hillsborough County, *Pasco County, *Step-backwater analysis.

Flood profiles are included for selected recurrence-interval floods in west-central Florida for a 27-mile reach of Cypress Creek, for a 4-mile tributary reach, and for a 1.2-mile distributary reach. The procedure for constructing flood profiles is based on flood heights computed in a step-backwater analysis using the following data: 2-, 2.33-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year flood-peak discharges; data for 53 Cypress Creek channel cross sections, 11 tributary cross sections, and 7 distributary cross sections (including roughness coefficients); and stage-discharge relations. Computed flood heights are judged to be generally accurate to plus-or-minus 0.5 foot. Flood data presented can be used to delineate areal extent of flooding on topographic maps. This information can be used by local governmental agencies to control flood-plain development. (Woodard-USGS)
W78-11987

8. ENGINEERING WORKS

8B. Hydraulics

INTERNATIONAL SYMPOSIUM ON RISK AND RELIABILITY IN WATER RESOURCES.
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-11386

IMPACT OF EXTREMAL DISTRIBUTIONS ON ANALYSIS OF MAXIMUM LOADING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. W. Shen, and M. Bryson.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 558-574, 1978. 7 fig, 1 tab, 7 ref.

Descriptors: *Hydraulic structures, *Flood magnitude, *Failure(Mechanical), *Reliability, Hydrologic data, Texas, Statistical methods, Safety, Estimating, Random loading, Statistical distribution, Equations, Systems analysis.

The tail end of more common statistical distribution of random loading can be shown to be approximately by either Gumbel Type I or Gumbel Type II extremal distributions. The ratio between the magnitude of a loading for a certain return period n sub 1 and the magnitude of a loading for another return period n sub 2 can be estimated by a simple relationship such as ln n sub 1/ln n sub 2 if the Gumbel Type I distribution is used. If the Gumbel Type II distribution is used, this same ratio is rather large because the Type II distribution is the distribution of the quantity whose logarithm has the Type I distribution. Hydrologic data collected

from Texas are used to illustrate the enormously different values resulting from using the two distributions with insufficient data. Many graphical solutions are given to express the relationship between the estimations of magnitudes of loadings and the parameters in the extremal distribution. Some practical limits on the ratio between the magnitude of loading with one return period and the magnitude of loading with another return period are established for Gumbel Type I distribution. General discussions are given on the following items: (1) alternate measures of reliability; (2) load distributions; and (3) extremal value distributions. (See also W78-11386) (Bell-Cornell)
W78-11392

ALLOWANCE FOR RISK AND UNCERTAINTY IN THE OPTIMAL DESIGN OF HYDRAULIC STRUCTURES,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
W. E. Watt, and K. C. Wilson.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 575-591, 1978. 4 fig, 5 ref.

Descriptors: *Hydraulic structures, *Risks, *Optimization, *Design, *Economic efficiency, Hydrologic aspects, Costs, Flood control, Probability, Equations, Mathematical models, Systems analysis, Damages, Loss minimization, Value maximization, Logarithmic model.

An optimal strategy for the design of hydraulic structures has been derived for use on a regional basis. Continuous functions for investment cost and probable damage cost are set up in a generalized form with parameters which depend on region and type of structure. The adoption of economic efficiency as the optimization criterion leads to an expression for the optimum design return period under conditions of 'perfect knowledge' or pure risk. The analysis is then extended to the 'real world' case in which uncertainties in the economic and hydrologic parameters in the relation for optimum return period lead to an overall uncertainty in estimating the optimum. It is found that, in general, the economic loss resulting from an underdesign caused by this uncertainty is greater than that for an equivalent overdesign and hence the 'real world' design return period should exceed the estimated value assuming 'perfect knowledge'. This increase is related to the degree of uncertainty and is expressed in terms of design factor. For the case of hydrologic uncertainty, this design factor is given in terms of the period of observed flow record. Illustrative examples are provided for two cases--major coastal protection works and a small project for river channel improvement. (See also W78-11386) (Bell-Cornell)
W78-11393

DETERMINATION OF HYDRAULIC RESISTANCE FOR A DAM-BREAK WAVE BY COMPARISON OF THEORY AND EXPERIMENTS,
Technische Univ., Munich (West Germany). Inst. of Hydraulics and Hydrology.
P-G. Franke, and W. Stahlin.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 609-615, 1978. 3 fig, 5 ref.

Descriptors: Hydraulics, *Flood waves, *Resistance, Water levels, Channels, Dams, Steady flow, Failure(Mechanical), Equations, Experiments, Theory.

A flood wave resulting from a sudden water release is most precisely calculated using the characteristic method with a free grid modified in the region of the wave front where the negative characteristics become steeper in the positive x-t-plane. For a horizontal, prismatic channel, exact values for the water level and the flow velocity can only be obtained if the hydraulic resistance is known. For a steady flow, the respective coefficient of resistance is usually determined by measuring the losses of energy. Generally this 'steady' coefficient of resistance is taken into account also for a rapidly varying unsteady flow. The investigations described herein show by a comparison of theory and experiment that this is not correct. A good agreement between the computation and the measured values can be obtained for the trajectory of the wave front as well as for the water level by using a reduced coefficient of resistance. The experimental investigations were made in a horizontal, rectangular test channel in the Institute of Hydraulics and Hydrology of the Technical University of Munich. (See also W78-11386) (Bell-Cornell)
W78-11395

HYDROLOGIC AND GEOMORPHIC CHANGES IN A RIVER BASIN INDUCED BY A DAM BREAK,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
Y. H. Chen, D. B. Simons, and A. Molinas.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Canada, June 26-28, 1978, p 616-625, 1978. 4 fig, 11 ref.

Descriptors: *Geomorphology, *Dams, *Failure(Mechanical), Hydrology, Changes, *Prediction, Effects, River basins, Hydraulic structures, Outflow, Floods, Reservoirs, Sediment discharge, Discharge(Water), Equations, Flood damage, Channels, Analytical techniques.

Dams rarely fail, but they may do so due to human error or because of rare hydrological or geological events, such as severe floods and earthquakes. Dam failure may cause loss of human life and extensive property damage. The damage induced by a dam breach is caused mainly by the tremendous forces exerted by the suddenly released flow that can destroy everything in its way. Also, sediments transported from the reservoir and channel can deposit on the floodplain causing additional damage to property. In order to reduce this damage, it is necessary to preassess the hydrologic and geomorphic changes in the river basin in case the dam fails. Herein, basic hydraulic and geomorphic principles are utilized to assess the effects of dam failure on the outflow discharge, river stage, sediment transport, and changes in channel dimensions and river form. The relations developed can serve as a guide to predict the possible hydraulic and geomorphic changes caused by failure of a dam. The prediction method presented determines maximum stage recognizing that the channel can add to the roughness diffusing the flow. Further research is needed to modify existing methods. (See also W78-11386) (Bell-Cornell)
W78-11396

A SYSTEMS APPROACH TO RISK ANALYSIS FOR AN EARTH DAM,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 8D.
W78-11417

SIZE DETERMINATION OF PARTLY FULL CONDUITS,
Stone and Webster Engineering Corp., Boston, MA. Hydraulic Div.
Y. G. Mussalli.
Journal of Hydraulic Division, American Society of Civil Engineers, Vol 104, No HY7, Proceedings Paper 13862, p 959-974, July 1978. 13 fig, 2 tab, 9 ref.

Descriptors: *Air-water interfaces, *Flow control, *Free surfaces, Pipes, Surface runoff, Vibrations, Hydraulics, Mathematical studies, Equations, *Air-water interactions, Pipe design, Sealing, Water tunnels.

The transition from partly full to full pipe (sealing) is accompanied by vibrations of the structure and surging of the flow. The experimental study was done in a 4-in (100-mm) square conduit with three different circular bends, with various deflectors, and with various concentrations of aair. Sealing depends on the Froude number of the flow. To maintain partly full flow, more space is needed above the water-flow area with an increase of Froude number. With short-tube control, the ratio of the radius of curvature along the center line to the bend diameter and the deflector thickness at the crown of the bend determine the water-flow area in the horizontal conduit. Ventilation of the horizontal conduit delays sealing, while aeration of the water flow hastens sealing. With weir control, waves on the flow surface hasten sealing, and highly aerated flow delays sealing. Ratios of radius of curvature to the bend diameter larger than 2.0 were recommended since they generate fewer waves. (Lee-ISWS)
W78-11433

SIMULATION AND DESIGN OF PUMPED STORMWATER SYSTEMS,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-11878

WELL STIMULATION AND SYSTEMS FOR RECOVERING GEOTHERMAL HEAT,
I. Sheinbaum.
U.S. Patent No. 4,079,590, 10 p, 10 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 968, No 3, p 861, March 21, 1978.

Descriptors: *Patents, *Geothermal studies, *Geophysics, *Borehole geophysics, Heat flow, Temperature, Thermal conductivity.

To overcome the disadvantage of deep pumps and to otherwise increase the ability to remove heat energy from the earth, a fluid is injected into the well in accordance with this invention to contact the heat energy within the earth and to act as a carrier of that heat to a system above the surface. In a well containing a hot fluid such as water, that has been heated by the heat within the earth, the injected fluid acts as a primer to stimulate the flow of the hot fluid from the well. The primer fluid or injected fluid is vaporized, the vapors thus formed mix with the hot fluid in the well and reduce the density of the column of well fluid in the well casing, which causes a pressure differential that forces this fluid from the well. The action of well stimulation may also be used to clean well deposits such as sand and other solids from the well. The flowed mixture of vaporized primer fluid and hot geothermal fluid, which may be both vapor and liquid, is used as a heat transfer fluid that is passed through a power extracting gas expansion device. The transfer of heat advantageously takes place in a direct contact heat exchanger where the mixture directly contacts a working fluid. (Sinha - OEIS)
W78-11948

8C. Hydraulic Machinery

DIRECTIONS OF SECURITY FOR THE OPERATION OF A HYDROELECTRIC POWER STATION WITH NON STEADY FLOW, (ARTICLE IN FRENCH),
Quebec Dept. of Natural Resources Water General Management.
N. K. Gidas.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water

Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Canada, June 26-28, 1978, p 889-908, 1978. 8 fig, 17 ref.

Descriptors: *Hydroelectric power, *Underground powerplants, *Design criteria, *Computer programs, *Simulation analysis, *Risks, *Reliability, Equations, Mathematical models, Operations research, Prediction, Surge chamber, Tailrace tunnels, Geometric characteristics.

The criteria used in the design of a particular type of surge chamber and tailrace tunnels have been defined for an underground hydroelectric power station. A simulation study has been made of the flow in the tailrace arrangement. This paper describes a computer program based on the equations for a non-steady flow produced by a total and instantaneous stop of the discharge of the power station; the program permits one to predict the risks and reliability of the operation of the power station in function of the geometric characteristics of the tailrace structure and the hydraulic conditions of the flow. Some of the results obtained from the computer have been completed with the help of experimental results. (See also W78-11386) (Bell-Cornell)
W78-11413

NINE PUMP INSTALLATION FOR WESSEX WATER AUTHORITY.
Water Services, Vol 82, No 987, p 293-294, May, 1978.

Descriptors: *Pumps, *Pumping plants, *Sewage treatment, *Sludge treatment, *Intakes, Filtration, Hydraulic design, Impellers, Hydraulic equipment, Treatment facilities, Design data, Waste water treatment, Municipal wastes.

Nine New Haden pumps, installed at the Kinson Sewage Disposal Works in Wessex, England, can accommodate a flow rate of 10,800 cu m/day. Three type 37 unchokeable pumps with 15 hp 960 rpm motors can each pump 216 cu m/hr of raw unscreened sewage at the sewage works inlet. They are equipped with single channel or double unchokeable impellers and pump against a total head of 8.15 m. Two type 36 semi-unchokeable pumps equipped with double channel shrouded impellers are used to move sludge from humus tanks to the sewage works inlet at a rate of 108 cu m/hr. These pumps have 10 hp, 1450 rpm motors that operate against a head of 13.37 m. Four type 36 semi-unchokeable pumps recirculate waste water to rotary bed filters. Each pump is equipped with a 15 hp, 960 rpm motor, operating at a rate of 234 cu m/hr against a head of 7.6 m. (Lisk-FIRL)
W78-11807

PREFAB PUMPING STATIONS.
Consulting Engineer, Vol 42, No 7, p 43, July, 1978.

Descriptors: *Pumping plants, *Plastics, *Concrete structures, *Pumps, *Sewers, Pipelines, Intakes, Outlets, Valves, Equipment, Electric power, Waste water disposal, Municipal wastes.

Sweden's Pumpex AB has designed a range of prefabricated sewage pumping stations with capacities rated up to 75 liters/sec. The pumping stations are supplied completely equipped in ddiameters of 2-2.5 m and heights of 2.2-5.2 m to accommodate the design depths of mains. The fiberglass-reinforced polyester tanks are equipped with pumps, pipework, valves, control system, and ladder. Installation comprises bolting the station to a concrete platform laid at the base of an excavation; the station is then connected to the inlet and outlet of the pumping main and to a power supply. Motor units may be removed and pump volutes may be attached through a steel plate at the base of the station. The stations may be purchased with options such as a radiator, platforms, lighting, and water heater; prices for the pumping stations start at 2,000 pounds sterling. (Lisk-FIRL)
W78-11811

MIXING FIXED-SPEED PUMPS TO VARIABLE FLOWS,
Dillon (M. M.) Ltd., London (Ontario).
G. Goldschmidt.
Journal Water Pollution Control Federation, Vol 50, No 7, p 1733-1741, July, 1978. 6 fig, 2 ref, 2 append.

Descriptors: *Pumping, *Pumps, *Mathematical models, *Critical flow, *Pumping plants, Hydraulic design, Inflow, Storage tanks, Variability, Cycles, Control, Sewerage, Waste water treatment, Municipal wastes.

Mathematical models investigated the adaptation of fixed speed screw pumps to variable storm water flows in collection chambers at lift stations. The objectives of the study were to match pumping and system parameters to the ranges of collection chamber inflows, to calculate a suitable control cycle, and to determine the cycle time between sequential pump starts when inflow exceeds the capacity of a pump. Other studies considered the critical inflow for minimum cycle time, the relationship between the water level in the tank and the pump discharge capacity, and the minimum storage volume required for a minimum pump cycle time under any inflow variation. Multiple pump operating sequences were determined by equations which calculated the distance between the control levels for the on and off pumps, the liquid level in the collection chamber above the off control level, the minimum recommended cycle time of the pump, and the pumping capacities of the pumps at the on and off control levels. The temporary trial storage volume heights were calculated for each pump. The combined pumping capacities were matched to the volume inflow rate. The critical inflows for minimum pump cycle time were derived from the volume flow rate, the portion of inflow exceeding pumping capacity at the on control level, the critical inflow parameter, the minimum cycle time and the area of the collection tank. (Lisk-FIRL)
W78-11849

WASTE-WATER CENTRIFUGAL DECANTERS FOR SEWAGE TREATMENT PLANTS.
Sulzer Technical Review, Vol 50, No 4, p 179, 1978.

Descriptors: *Centrifugal pumps, *Sewage sludge, *Dewatering, *Sludge treatment, *Rotors, Flocculation, Hydraulic design, Hydraulic equipment, Design data, Sludge disposal, Treatment facilities, Municipal wastes.

The ZDA series of municipal waste water centrifugal decanters, manufactured by Escher Wyss, offers minimal flocculant consumption with optimum concentrate purification. The decanter produces a dewatered sewage sludge that is suitable for direct storage or application to agricultural land as an organic fertilizer. The dewatered sludge may also be dried further and incinerated. Rotor diameters of 360, 500, 630 mm are available; the ZDA-50 model has a maximum nominal capacity of 18 cu m/hr. Escher Wyss can supply the centrifugal decanters with adjustable, fixed or in-service controllable speeds to operate the solids discharge screw. The centrifugal decanters are also suitable for chemical and mining industrial applications. (Lisk-FIRL)
W78-11911

WIND OR WATER OPERATED POWER PLANT,
N. Cohen.
U.S. Patent No. 4,079,264, 10 p, 26 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 968, No 2, p 732, March 14, 1978.

Descriptors: *Patents, *Energy, Energy conversion, Electric power production, Flow, Winds, Hydrodynamics, Equipment.

A fluid operated power generating system comprises a power producing unit or an array of such units adapted to be positioned in a flow of fluid. Each unit includes end walls configured to cause fluid to flow in a rectilinear path and has a passage leading from a lateral inlet to a lateral outlet. The through passage defines a constricted zone causing the velocity of the fluid passing through to increase and the pressure of the fluid to drop in the constricted zone. A rotary device is in communication with the constricted zone and the pressure differential in the zone rotates the device. While the fluid operated system is primarily in connection with wind power, those skilled in the art of aero dynamics and hydrodynamics will readily be able to adapt at least some of the described systems to use with liquids, such as river currents and tides. The only essential requirement being the presence of a flow or stream of fluid into which the power producing units are placed. (Sinha - OEIS)
W78-11947

SMALL CONTRACTORS TAKE ON TOUGH PIPE PLACEMENT.
For primary bibliographic entry see Field 5D.
W78-11956

SUBMERSIBLE SEWAGE PUMPS.
Pollution Engineering, Vol 10, No 6, p 95, June, 1978.

Descriptors: *Pumps, *Sewage, *Wet wells, *Submergence, *Equipment, Viscosity, Turbidity, Sumps, Pumping, Impellers, Equipment, Construction materials, Waste water treatment, Municipal wastes.

The Hyr-O Pumps Division of Wylain, Inc. has developed a new line of non-clog submersible sewage pumps. The 4-inch S4N Series pumps were designed for high efficiency wet well pumping in the intermediate range and lower capital costs. The units have the capacity to pump grease, dirt, raw sewage, and solids up to 3 inches in diameter. The S4N Series accommodates capacities up to 580 gal/min with head sizes up to 56 ft. The two-vaned impeller is constructed of cast iron and balanced to ensure clog-free, quiet, vibrationless performance. The pumps are suitable for liquids with pH values in the range of 6-9; the submersible units can also accommodate specific gravities in the 0.9-1.1 range and viscosities in the range of 28-35 Saybolt seconds universal. (Lisk-FIRL)
W78-12036

8D. Soil Mechanics

LANDSLIDE POTENTIAL AND PROBABILITY CONSIDERING RANDOMNESS OF CONTROLLING FACTORS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
T. J. Ward, R-M. Li, and D. B. Simons.
In: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources'. E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978, p 592-608, 1978. 6 fig, 4 tab, 28 ref.

Descriptors: *Landslides, *Probability, *Monte Carlo method, *Simulation analysis, *Groundwater, *Geotechnical model, *Slope stability, Numerical analysis, Safety factors, Failure(Mechanical), Estimating, Methodology, Rainfall, Sensitivity analysis, Equations, Computer models, Systems analysis.

Geotechnical models of slope stability can be used to provide a numerical method for determining landslide potential and probability. Landslide potential is based on the factor of safety computed from an infinite slope limit equilibrium model. After sensitivity analyses, the equilibrium model can be used to determine landslide probability or the probability that the computed factor of safety will be less than or equal to one. A landslide probability, or the chance that a landslide will occur, is needed in conjunction with a landslide potential in order to account for uncertainty in the variables that comprise the model. Assumed frequency distributions for the variables influence the computed probability and must be chosen carefully to avoid underestimation of the chance of failure. Because landslides are often associated with high precipitation which produces fluctuations in groundwater level, probable storm magnitude also should be examined; changes in groundwater level have a nonlinear effect on landslide probability, indicating reasons why a slight fluctuation in groundwater level may trigger landslide probability. Simple groundwater models can be used to define this probability in terms of rainfall return periods. Landslide potential and probability delineation provide the land use planner or forest engineer with a useful method of hazard analysis. Potential delineation indicates relative hazards betweem sites while probability accounts for uncertainty in the model variables. (See also W78-11386) (Bell-Cornell)
W78-11394

A SYSTEMS APPROACH TO RISK ANALYSIS FOR AN EARTH DAM,
Utah Water Research Lab., Logan.
D. S. Bowles, L. R. Anderson, and R. V. Canfield.
Supplemental article; Abstract only (p 626), in: Proceedings, Volume II, 'International Symposium on Risk and Reliability in Water Resources.' E.A. McBean, et al. (Eds.), University of Waterloo, Waterloo, Ontario, Canada, June 26-28, 1978. 3 fig, 2 tab, 8 ref, 13 p. (Reprint available from author).

Descriptors: *Failure(Mechanical), *Hydraulic structures, *Earth dams, Safety, *Risks, Projects, Decision making, Equations, Estimating, Systems analysis.

From time to time the failure of a dam will focus public attention on the subject of dam safety. Regardless of the care taken in the siting, design, and construction of a dam, some residual level of risk of a catastrophic failure of the structure will remain. The event that causes the failure may be of natural origin (e.g., flood, earthquake), it may be related to the structure itself (e.g., uneven settlement, embankment slips), or it may be related to human error (e.g., incorrect operation, acts of war). The techniques of risk-based design have not been developed for, and applied to earth dam projects. These techniques involve the identification and estimation of risks, and the taking of risk reduction or risk acceptance actions using a decision analysis framework. The paper presents an event-outcome-exposure-consequence path approach to risk analysis for earth dams. The proposed approach will make use of additional data as it becomes available during the life of an earth dam project and will handle 'total risk' rather than risk associated with only a single failure mechanism. (See also W78-11386) (Bell-Cornell)
W78-11417

DAMS ON PERMAFROST,
G. F. Biyanov.
CRREL Draft Translation 555, November 1976. 234 p, 125 fig, 18 tab, 108 ref. Translated from Energiya, Moscow (USSR), 1975. 184 p.

Descriptors: *Dams, *Permafrost, *Cold weather construction, *Frozen ground, Earth dams, Rockfill dams, Construction, Structures, Hydraulic structures, Dam construction, Spillways, Permeability, Infiltration, Percolation, Thawing, Freezing, Temperature, Engineering, Civil engineering, *USSR.

Problems of building dams of natural materials on permafrost under severe climatic conditions in the Far North were discussed on the basis of experience in this country and abroad. Cases of damage to dams and sluice-ways and its repair were described. Requirements for surveys, planning, and research in connection with building water-related structures on permafrost were presented. The book was intended for engineers specializing in water engineering matters and can be useful to students in institutions of higher learning and technical schools. (Sims-ISWS)
W78-11435

APPROXIMATE METHOD OF CALCULATING THE TEMPERATURE STEADY STATE OF WATER-PERMEABLE DAMS,
A. P. Stavovskiy.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 653, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 598, February 1977. 7 p, 1 fig, 1 tab, 4 ref. Translated from Russian.

Descriptors: *Earth dams, *Cold regions, *Infiltration, *Groundwater movement, Reservoirs, Temperature, Frozen ground, Permafrost, Thawing, Dams, Structures, Hydraulic structures, Water-permeable dams.

In permafrost areas, in addition to water impermeable dams, use is made of water permeable dams. The thermal conditions of these dams have been studied under the conditions of the planar problem. On the basis of the functions available for determining the temperature steady-state of water-permeable dams, this paper proposed dependencies, utilizing N.K. Girinskiy's hydrodynamic functions. (Sims-ISWS)
W78-11436

METHOD FOR THE STUDY OF INFILTRATION UNDER FIELD CONDITIONS: FIRST RESULTS,
For primary bibliographic entry see Field 2G.
W78-11437

APPROXIMATE CALCULATION OF THE THERMAL REGIME OF RESERVOIRS FORMED BY A FROZEN DAM,
A. I. Pekhovich, L. I. Kudoyarov, and V. M. Zhidkikh.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 540, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 662, November 1977. 13 p, 3 fig, 4 ref. Translated from Izvestiya Vsesoiuzni Nauchno-Issledovatel'skii Institut Gidrotekhniki, Vol 192, p 146-153, 1972.

Descriptors: *Reservoirs, *Water temperature, *Cold regions, *Structures, Dams, Frozen ground, Ice, Earth dams, Model studies, Mathematical models, Cold regions, Cold weather construction, Temperature, Heat, Analytical techniques.

The task of building frozen structures involves a number of problems, one of which is knowing the thermal regime of the part of the reservoir which is in contact with the dam, since it constitutes a warm interface with the frozen dam and foundation. The goal of this paper was to provide a general scheme and practical method for calculating the thermal regime of a reservoir, taking into account the thermal interaction with the dam and the foundation and examining the possibility of regulating the thermal regime of the structure. (Sims-ISWS)
W78-11438

DESIGNATIONS OF EXCAVATION CHARACTERISTICS FOR MATERIALS IDENTIFIED IN FIELD INVESTIGATIONS,
Tennessee State Dept. of Transportation, Nashville. Div. of Soils and Geologic Engineering.
For primary bibliographic entry see Field 4B.
W78-11875

PORE STRUCTURE OF SELECTED HAWAIIAN SOILS,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State. Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 2G.
W78-11876

INSULATED ROAD STUDY,
National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.
For primary bibliographic entry see Field 2C.
W78-11877

HYDRAULIC CONDUCTIVITY OF ROCKFILL,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-11896

8E. Rock Mechanics and Geology

EFFECT OF INTRAGRANULAR POROSITY ON COMPACTION,
Illinois Inst. of Tech. Chicago.
S. K. Saxena, and C. Hendrikson.
Journal of the Geotechnical Division, American Society of Civil Engineers, Vol 104, No GT1, Proceedings Paper 13965, p 1053-1059, August 1978. 3 fig, 4 ref.

Descriptors: *Compaction, *Porosity, *Density, Limestones, Granules, Landfills, Voids, Specific gravity, Effects, Equations, Dry density, Intragranular porosity.

The variation in intragranular porosity of limestones often does not allow the specified compaction standards to be fulfilled. The problem has caused embarrassment to engineers and loss of time and money to owners. In this paper, the effects of the intragranular porosity on the maximum dry density of a compacted fill were presented. Charts were presented depicting the influence of intragranular porosity and specific gravity on the maximum dry densities. (Visocky-ISWS)
W78-11895

8F. Concrete

ANSWERING MECCA'S SEWERAGE PRAYERS.
For primary bibliographic entry see Field 5D.
W78-11798

8G. Materials

IMPACT OF EXTREMAL DISTRIBUTIONS ON ANALYSIS OF MAXIMUM LOADING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-11392

SIZE DETERMINATION OF PARTLY FULL CONDUITS,
Stone and Webster Engineering Corp., Boston, MA. Hydraulic Div.
For primary bibliographic entry see Field 8B.

W78-11433

COMPRESSIBILITY CHARACTERISTICS OF COMPACTED SNOW,
Cold Regions Research and Engineering Lab., Hanover, NH. Applied Research Branch.
For primary bibliographic entry see Field 2C.
W78-11442

STANDARD UNITS SOLVE SEWAGE TANK ACCESS PROBLEM.
Surveyor, Vol 151, No 448A, p 26, May, 1978.

Descriptors: Basins, *Storm runoff, *Storm drains, *Cleaning, *Bridge design, Cantilevers, Engineering structures, Aluminum, Channels, Construction materials, Storage tanks, Underground structures, Waste water treatment, Municipal wastes.

Stephens and Carter of Brentford, Middlesex, England, custom designed an access walkway for the underground sewage balancing tanks at a treatment plant in Amersham, England. The underground basins, which are employed during peak and storm periods, require periodic cleaning. The four pentagonal tanks have bases which slope down to central channels; this configuration made access and footing difficult. The walkway is constructed of Climalloy components connected by aluminum sections. The access unit spans the central channel of the basin and is held in position by the counterbalance of the splayed castors at each corner; the unit is 3.05 m long, and 1.35 m wide. The span has aluminum decks which are adjustable up to maximum height of 2.76 m. The unit is mobile and can be used in all four balancing tanks. (Lisk-FIRL)
W78-11677

SOME THOUGHTS ON PIPELINES PAST, PRESENT AND FUTURE,
E. N. Andrews.
Public Health Engineer, Vol. 6, No. 3, p 151-157, 1978. 3 fig, 1 tab, 6 ref.

Descriptors: *Concrete pipes, *Steel pipes, *Metal pipes, *Plastic pipes, *Clay pipes, Sewerage, Water supply, Drainage systems, Construction materials, Corrosion resistance, Pipeline, Plastics, Engineering structures, Waste water treatment, Municipal wastes.

The properties and applications of iron, steel, plastic, concretes, clay, and pitch fiber pipes are reviewed for use in sewerage, water supply, gas and oil transport, drainage, and industrial structures. High-speed spun concrete pipes provide a high crushing strength, high density, corrosion resistance, smooth concentric bores with abrasion resistance, and accurately-formed jointing surfaces. Fiberglass is often used in place of steel for reinforcing concrete pipes. Gas lines are typically constructed of cast or ductile iron, polyethylene, or steel; water supply pipes can be constructed of a variety of materials such as iron, concrete, asbestos, polyvinyl chloride, polyethylene, and reinforced plastics. Rigid pipes, such as asbestos cement, gray cast iron, clay, and concrete, support the entire trench and the superimposed material or traffic load; flexible pipes transfer the vertical load of the soil to a horizontal plane which is supported by the trench walls. Pipeline manufacturing faults, design errors, environmental conditions, and installation and operational problems contribute to pipeline failure; soil surveys, groundwater sampling, water monitoring, and stress testing are recommended to prevent pipe failures. (Lisk-FIRL)
W78-11799

THE LAYING OF UNDERWATER POLYETHYLENE PIPELINES USING THE ATMOSPHERIC COUNTERPRESSURE METHOD (DAS VERLEGEN VON SEELEITUNGEN AUS POLYATHYLENROHREN IM LUFTGEGENDRUCKVERFAHREN),
H. G. Ursprung.
Gas- und Wasserfach, Wasser-ABwasser, Vol. 119, No. 5, p 262-266, May, 1978. 5 fig.

Descriptors: *Plastic pipes, *Submergence, *Sewerage, *Pressure, *Flooding, Plastic deformation, Buoyancy, Resistance, Stress, Atmospheric pressure, Graphical analysis, Model studies, Pipelines, Municipal wastes, Underwater.

An atmospheric counterpressure method was developed for emplacement of tubular polyethylene pipes in deep water or in unstable ground without subjecting the pipe to bending stresses or tension. Conditions affecting polyethylene pipelines in deep water or in unstable ground cannot be adequately controlled by calculating the unit stress of the material. Consideration of all internal and external pressures on the pipe material at the moment of sinking is recommended to prevent unnecessary stress. The counterpressure technique of sinking the pipe was developed mathematically and graphically from the parameters: horizontal and vertical water resistance, work of pipe weight, buoyancy, energies of the air and flooded water columns, the length of the flooded water column, the allowable impact, and the sinking velocity. Input of these factors into an atmospheric counterpressure model permits control of the flooded pipe's movement during sinking operations. (Lisk-FIRL).
W78-11800

DISPATCHER SIGNALIZATION OF OPERATIONAL DISTURBANCES IN SEWER SYSTEM PUMP STATIONS (AID FOR DESIGNERS) (DISPETCHERSKAYA SIGNALIEATSIYA O NARU SHENII NORMAL'NOGO REZHIMA RABOTY KANALIZATSIONNYKH NASOSNYKH STANTSII) (V POMOSHCH' PROEKTIROVSHCHIKU),
A. S. Ivashkov.
Vodosnabzhenie i Sanitarnaia Tekhnika, No. 3, p 34-35, 1978. 2 fig.

Descriptors: *Instrumentation, *Monitoring, *Pumping plants, *Remote sensing, *Data transmission, Flooding, Electric power failure, Warning systems, Transmission lines, Hyrologic data, Networks,, Sewerage, Waste water treatment, Municipal wastes.

A relay-type signalization network using telephone cable has been developed for transmitting data on operational disturbances in sewer system pumping stations. The distance over which the signal can be transmitted ranges from 5 to 15 km, depending on the diameter of telephone wire employed (0.5-1.2 mm). The system can notif, operators of a variety of conditions, encompassing flooding of the pumping station, power losses, and other pumping plant defects. (Takacs-FIRL)
W78-11801

FLUID TREATMENT WITH PLASTICS PASTA.
For primary bibliographic entry see Field 5D.
W78-11809

EFFECTIVENESS OF BACKWASHING FOR WASTEWATER FILTERS,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 5D.
W78-11816

METHODS FOR CHECKING THE OPERATION OF ACTIVATED-SLUDGE WASTEWATER TREATMENT PLANTS AND FOR DETERMINING DESIGN CRITERIA FOR NEW TREATMENT FACILITIES (MODSZEREK ELEVENISZAPOS SZENNYVIZTISZTITO TELEPEK UZEMENEK ELLENORZESERE, UJ TELEPEK TERVEZESI ADATAINAK A MEGHATAROZASARA),
Fovarosi Csatornazasi Muvek, Budapest (Hungary).
For primary bibliographic entry see Field 5D.
W78-11837

HYDRAULIC ANALYSIS OF MODEL TREATMENT UNITS,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 5D.
W78-11855

EVALUATION OF FREEZE-THAW DURABILITY OF STABILIZED MATERIALS.
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
M. R. Thompson, and B. J. Dempsey.
In: Subsidence Over Mines and Caverns, Moisture and Frost Actions, and Classification: Transportation Research Record 612, Transportation Research Board, National Academy of Sciences, Washington, D.C., p 62-70, 1976. 9 fig, 1 tab, 14 ref.

Descriptors: *Freeze thaw tests, *Laboratory tests, *Model studies, *Durability, *Illinois, Soils, Gravels, Soil amendments, Testing procedures, Evaluation, Design criteria, Strength of materials, Paving, Crushed stone.

A suggested procedure for evaluating the freeze-thaw durability of stabilized materials was developed. Pertinent background information and previous related studies were summarized. The residual strength concept was used in the suggested evaluation procedure. Quantitative characterization of cyclic freeze-thaw action, freeze-thaw testing procedures and techniques, durability criteria, and construction influences were considered. Detailed data were presented for Illinois conditions, and the applicability of the proposed procedure was illustrated. It was demonstrated that current technology is sufficient to develop a realistic approach for evaluating the freeze-thaw durability of stabilized materials. (See also W78-11865) (Humphreys-ISWS)
W78-11874

CORROSION IN CLOSED WHITE WATER SYSTEMS,
Institute of Paper Chemistry, Appleton, WI.
For primary bibliographic entry see Field 5C.
W78-11919

LASER MADE FOR PIPE-LAYING.
Surveyor, Vol 151, No 4484, p 26, May, 1978.

Descriptors: *Tracking techniques, *Pipelines, *Remote sensing, *Sewerage, *Equipment, Electronic equipment, Gradiation, Construction, Instrumentation, Pipes, Waste water treatment, Municipal wastes.

The 1055 Dialgrade laser, developed by Spectra-Physics Ltd. of St. Albans, Hertsfordshire, England, is equipped with two axis level compensation for rapid, automatic leveling in pipe emplacement. During set-up, the laser is rough-levelled; after the initial set up, the laser automatically levels, plus or minus 5 degrees within one minute. The laser moves right or left over a plus or minus 4 degree range and over, plus or minus 3 degrees in a perpendicular direction. Push button level controls are located on the back of the unit which has a viewing telescope for following the beam. The laser automatically levels in a 6-inch diameter pipe with a grade of 9% when the unit's rubber bumpers are removed; the laser is centrally aligned with the rubber bumpers in 8-inch diameter pipes with diameters of 10-15 inches; in larger pipes or flat-

bottomed manholes, a trivet mounting is used. The laser is equipped with a signal light and a warning system to inform the operator of adjustment requirements. (Lisk-FIRL)
W78-11955

8I. Fisheries Engineering

INSTREAM FLOW AND THE REPRODUCTIVE EFFICIENCY OF SOCKEYE SALMON,
Washington Univ., Seattle. College of Fisheries.
J. Stober, R. E. Narita, and A. H. Hamalainen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 071, Price codes: A07 in paper copy, A01 in microfiche. Fisheries Research Institute, Report FRI-UW-7808, June 1978. 124 p, 21 tab, 39 fig, 60 ref. OWRT B-065-WASH(1), 14-31-0001-6132.

Descriptors: *Instream flow, Water diversion, *Sockeye salmon, Density-dependent mortality, Fry production, Flood effects, *Egg densities, Samples, *Fish management, Environmental effects, Stream habitat, *Reproduction(Fish), *Juvenile growth stage, *Growth rates, Washington, Cedar River(Wash).

The factors controlling reproduction and early development of sockeye salmon included the effects of augmented low flows, uncontrolled floods and density-dependent mortality. Density-dependent mortality due to redd superimposition occurred on a static spawning area where about 50 percent of the potential eggs were deposited. A higher egg deposition efficiency of about 80 and 100 percent occurred on reaches where spawning area accumulated with an increase in discharge. Substrate scouring due to a flood (249.3 m to the 3rd power/sec) reduced egg/alevin densities by 50.6 and 96.6 percent on two reach types sampled. The presmolt-to-spawner ratio ranged from 5.8 following the flood to 20.2 following augmented low flow and no flood. Fry production in 1976 and 1977 was 1.75 X 10 to the 6th power respectively, representing survival rates of 0.81 and 8.1 percent. A sustained flood loss of 42 percent of the spawning habitat coupled with a 22 percent increase in escapement appears to have increased the density-dependent mortality and reduced the contribution of the early spawners to the total fry production. These results should help to establish an efficient escapement goal for the Cedar River sockeye and find application on salmon streams affected by hydroelectric or diversion projects where stream discharge can be managed to maximize spawning area to benefit fish production. (See also W78-11362)
W78-11361

PRESPAWNING MORTALITY AND THE REPRODUCTIVE EFFICIENCY OF CEDAR RIVER SOCKEYE SALMON (SUPPLEMENTAL REPORT),
Washington Univ., Seattle. College of Fisheries.
Q. J. Stober, S. Crumley, and R. S. McComas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 055, Price codes: A04 in paper copy, A01 in microfiche. Fisheries Research Institute, Report FRI-UW-7809, June 1978. 53 p, 16 fig, 10 tab, 14 ref. OWRT B-065-WASH(2), 14-31-0001-6132.

Descriptors: *Prespawning mortality, *Sockeye salmon, Flood effects, Egg densities, Samples, *Spawning habitat, Environmental effects, *Fish management, Density-dependent mortality, Instream flow, *Mortality, *Reproduction(Fish), *Washington, *Cedar River(Wash).

An escapement of 410,000 sockeye salmon was monitored during the fall of 1977 in the Cedar River. A large prespawning mortality apparently due to infestation of the fish with the parasitic copepod, Salmincola, was observed. This resulted in an estimated differential mortality of about 119,813 females and an effective survival of 117,987 females. The total maximum effective escapement was estimated at 290,187 sockeye. The amount of area spawned in the 28.8 km of river below Landsburg remained approximately the same in 1976 and 1977 at 60,000 m squared, while the total escapement increased about three times. This strongly indicated a sustained reduction in the spawning habitat following a severe (249.3 m to the 3rd power/sec) December 1975 flood. Reduction of the spawning habitat as a result of major floods may necessitate an adjustment in the escapement goal. Extensive mass spawning and a large prespawning mortality prevented reliable estimates of the potential egg densities on the spawning reaches where hydraulic egg samples were collected. For these reasons the efficiency of egg deposition could not be adequately determined. Intragravel mortality occurred at similar times and levels as found during the 1976 spawning season. Flood losses of 49 and 86 percent of the egg-alevins were found on two reaches following a discharge of 116 m to the 3rd power/s in December 1977. (See also W78-11361).
W78-11362

LONG RANGE MOVEMENT AND HOMING BY LARGEMOUTH BASS (MICROPTERUS SALMOIDES) IN A THERMALLY ALTERED RESERVOIR,
Wake Forest Univ., Winston Salem, NC. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-11675

OLFACTORY IMPRINTING AND HOMING IN SALMON,
Wisconsin Univ.-Madison. Dept. of Zoology.
A. D. Hasler, A. T. Scholz, and R. M. Horrall.
American Scientist, Vol. 66, p 347-355, 1978. 3 fig, 1 tab, 61 ref.

Descriptors: *Salmonids, *Fish migration, Fish behavior, Juvenile growth stage, Migration, Life history studies, Fish physiology, Salmon, Fish hatcheries, Fish management, Anadromous fish, Trout, Fish reproduction, *Imprinting.

The olfactory hypothesis for salmon homing has three basic tenets: (1) because X of local differences in soil and vegetation of the drainage basin, each stream has a unique chemical composition and, thus, a distinctive odor; (2) before juvenile salmon migrate to the sea they become imprinted to the distinctive odor of their home stream; and (3) adult salmon use this information as a cue for homing when they migrate throughh the home-stream network to the home tributary. A summary is presented of recent experiments in which salmon have been artificially imprinted to a synthetic chemical, veryifying the olfactory hypothesis for salmon homing. (EIS-Katz)
W78-11676

TEMPERATURE AND WATER VELOCITY EFFECTS ON THE SWIMMING PERFORMANCES OF YOUNG-OF-THE-YEAR STRIPED MULLET (MUGIL CEPHALUS), SPOT (LEIOSTOMUS XANTHURUS), AND PINFISH (LAGODON RHOMBIDIES),
North Carolina State Univ., at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-11704

CULTURING AND ECOLOGY STUDIES OF THE ROTIFER POLYARTHRA VULGARIS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 5G.
W78-12008

9. MANPOWER, GRANTS AND FACILITIES

9C. Research Facilities

THE WRC-WHERE THEY KNOW A BIT ABOUT WATER AND ARE LEARNING ALL THE TIME.
For primary bibliographic entry see Field 5G.
W78-11795

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

BIBLIOGRAPHY ON THE EFFECTS OF PRESCRIBED BURNING AND MAMMAL AND WATERFOWL UTILIZATION OF WETLANDS: ANNOTATED LITERATURE SEARCH WITH SELECTED ABSTRACTS,
Fish and Wildlife Service, Annapolis, MD. Div of Ecological Services.
F. W. Rutkosky.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 117, Price codes: A03 in paper copy, A01 in microfiche. June 1, 1978, 45 p.

Descriptors: *Burning, *Marsh management, *Muskrats, *Bulrush, *Canada goose, *Grazing, *Scirpus species, Wildlife management, Waterfowl, Tidal marshes, Coastal marshes, Habitat improvement.

This bibliography was compiled as a preliminary study product for ongoing studies of marsh loss occurring at Blackwater National Wildlife Refuge, in Cambridge, Maryland. It includes 176 references which have been indexed, of which 47 have been abstracted. Prescribed burning practices and grazing by muskrat, nutria and geese are potential factors to be considered in the determination of remedial measures. (Bastress-FWS)
W78-11385

ANNOTATIONS OF SELECTED LITERATURE ON NONSTRUCTURAL FLOOD PLAIN MANAGEMENT MEASURES,
Hydrologic Engineering Center, Davis, CA.
For primary bibliographic entry see Field 6F.
W78-11455

USE OF BIOLOGICAL INDICATOR ORGANISMS TO QUANTITATE ORGANOCHLORINE POLLUTANTS IN AQUATIC ENVIRONMENTS - A REVIEW,
Uppsala Univ. (Sweden). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W78-11540

COLD-CLIMATE WATER/WASTEWATER TRANSPORTATION AND TREATMENT – A BIBLIOGRAPHY,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5D.
W78-11574

ILLINOIS DATA CATALOG (PRELIMINARY PRINT).
Illinois Inst. for Environmental Quality, Chicago.
For primary bibliographic entry see Field 7C.
W78-11631

BIOASSAYS-PROCEDURES AND RESULTS,
Research Triangle Inst., Research Triangle Park, NC.

For primary bibliographic entry see Field 5A.
W78-11834

10D. Specialized Information Center Services

TRANSFER OF WATER RESOURCES KNOWLEDGE - AN ASSESSMENT,
North Carolina Water Resources Research Inst.
For primary bibliographic entry see Field 10F.
W78-11384

10F. Preparation Of Reviews

TRANSFER OF WATER RESOURCES KNOWLEDGE - AN ASSESSMENT,
North Carolina Water Resources Research Inst.
N. S. Grigg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 132, price codes: A05 in paper copy, A01 in microfiche. UNC-WRRI Report No. 132, July 1978. 85 p, 5 fig, 10 ref, 5 append. OWRT T-0012(6709)(1).

Descriptors: *Research priorities, *Research management, *Technology transfer, *Knowledge transfer, Management, *Information exchange.

Water resources knowledge transfer seeks to make best use of scientific and technical information in water management. It is an important process in water research management because its outcome determines the effectiveness of entire programs. The report contains an analysis of the problem in the water sector, a general overview of the 'technology transfer' question, presentation of conceptual models for transfer, and recommendations for policy changes. The genesis of the report lies in the planning and organization of the Second International Conference on Transfer of Water Resources Knowledge. The Conference was held in summer, 1977, at Fort Collins, Colorado. Conference Proceedings are issued separately containing 98 specific papers on knowledge transfer. (Kiger-NC St)
W78-11384

USE OF BIOLOGICAL INDICATOR ORGANISMS TO QUANTITATE ORGANOCHLORINE POLLUTANTS IN AQUATIC ENVIRONMENTS - A REVIEW,
Uppsala Univ. (Sweden). Dept. of Zoology.
For primary bibliographic entry see Field 05A.
W78-11540

SUBSIDENCE OVER MINES AND CAVERNS, MOISTURE AND FROST ACTIONS, AND CLASSIFICATION.
For primary bibliographic entry see Field 04B.
W78-11865

GEOLOGIC INDICATORS OF CATASTROPHIC COLLAPSE IN KARST TERRAIN IN MISSOURI,
Missouri Dept. of Natural Resources, Rolla. Div. of Geology and Land Survey.
For primary bibliographic entry see Field 02F.
W78-11870

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

- 1 NATURE OF WATER
- 2 WATER CYCLE
- 3 WATER SUPPLY AUGMENTATION AND CONSERVATION
- 4 WATER QUANTITY MANAGEMENT AND CONTROL
- 5 WATER QUALITY MANAGEMENT AND PROTECTION
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A15	12.00	E15	34.00	T15	800.00
A16	12.50	E16	37.00	T16	850.00
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